DRAFT FINAL REPORT

ENVIRONMENTAL BASELINE SURVEY
SITES A, C, L, AND S
FORT GEORGE G. MEADE
ANNE ARUNDEL COUNTY, MARYLAND

CONTRACT NO. W912DR-04-D-0003, DELIVERY ORDER 0005

Prepared on behalf of

Baltimore Corps of Engineers

Prepared for

Fort George G. Meade

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Executive Summary

URS Group, Inc. (URS), under contract number W912DR-04-D-0003 with the U.S. Army Corps of Engineers (USACE), conducted an Environmental Baseline Survey (EBS) of four site areas at the U.S. Army Garrison Fort George G. Meade (FGGM), located in Anne Arundel County, Fort Meade, Maryland (Figure 1-1). Sites A, C, and L are located in the eastern portion of FGGM, and Site S is located in the southeast corner of the base (Figure 1-2).

URS, using teams of qualified environmental professionals, reviewed existing documents pertaining to the sites, conducted an on-site reconnaissance of the subject properties, interviewed FGGM personnel, took photographs, reviewed Historical Topographic Maps and Historical aerial photographs of FGGM, and reviewed Environmental Database Summaries.

In general, the topography of FGGM is relatively flat. FGGM is located on the unconsolidated sands, clays, and silts of the Atlantic Coastal Plain physiographic province. Shallow groundwater flow generally follows surface drainage; deep groundwater flows to the southeast. There are upper and lower groundwater aquifers beneath FGGM which are generally separated by a low permeability clay unit that keeps these aquifers distinct for the most part.

FGGM is located in the Little Patuxent River Watershed. Several tributaries on FGGM flow into the Little Patuxent River.

FGGM has been an active military facility since 1917 and has undergone many physical changes since that time. The four sites investigated as part of this EBS have undergone varying degrees of change.

Site A is classified in the Administrative Zone. Over the years, Site A has seen little development and has been used mostly for ball fields. Currently, ball fields, bleachers and lighting cover most of the site. The only improvements are Building 2724 and a recreational vehicle storage yard (RV park), which occupy the southern end of Site A. In the past, another building (2728) was located in the southwestern portion of this site. Environmental investigations had been conducted at Building 2724, the wash racks and oil/water separators located west of Building 2724, and the wash racks at Building 2728. Soil and groundwater samples were collected for chemical analysis and some compounds were detected above certain EPA Region III Risk-Based Concentrations (RBCs) and Maryland Department of the Environment (MDE) cleanup standards. Arsenic was one of the compounds detected in soil. It was detected at concentrations of 2 mg/kg or greater in eight of the samples collected, including surface and subsurface samples; the highest concentration was 2.7 mg/kg. The EPA residential value is 0.43 mg/kg and the industrial value is 1.9 mg/kg. The MDE residential value is 2.0 and the nonresidential value is 3.8 mg/kg. The herbicide MCPA and Total Petroleum Hydrocarbons (TPH)-Diesel Range Organics (DRO) recorded the greatest exceedances in groundwater. Several metals and VOCs (including carbon tetrachloride) also exceeded action levels. The greatest concentration of MCPA was 1,400 µg/l, compared to an RBC for tap water of 18 µg/l. The greatest concentration of TPH-DRO was 620 µg/l, compared to an MDE Groundwater Standard of 47 µg/l.

Due to the age of the buildings, lead from lead-based paint (LBP) may also be present on the existing building and in the soil around the existing building and in the soil around the former building location.

Site A contains designated Forest Conservation Act (FCA) areas. Development at this site would need to comply with Maryland FCA requirements. FGGM voluntarily supports the Maryland FCA and complies with the Act on a case-by-case basis. The FCA applies to all

activities requiring a permit for subdivision, grading, or sediment control and that involve more than 40,000 square feet, or slightly less than 1 acre. The FCA provides guidelines for the amount of forest land to be retained or planted after the completion of development projects. These guidelines vary for each development site and are based on land-use categories. Site A contains a portion of a stream channel in the northwest corner of the site that is subject to a 25-meter buffer requirement.

The majority of Site A is suitable for transfer; Environmental Conditions of Property Classification (ECOP) category for the majority of the site is 1. The southernmost portion of Site A, around the current and former building locations would score a 6/7. It would score a 6 because chemical compounds detected in soil and groundwater were above action levels. It also scores a 7 because there is the potential for lead to be present in soil above action levels. Site soils in the vicinity of the current and former buildings have not been sampled for lead.

Over the years, Site C had numerous barracks constructed in support of War efforts; most of those barracks have been torn down. Currently, the west-central quadrant of Site C contains wood-framed structures that are used for offices, meeting rooms, and storage. The east-central quadrant is currently an open field with remnant asphalt surfaces. The northern and southern boundaries of the site have remained woodland over the years. The only environmental studies at Site C have been of potential asbestos-containing materials (ACM). Some materials in some of the buildings currently on-site were determined to contain asbestos. One other environmental study had been conducted in the area; a study of the Equipment/Vehicle Storage Yard Wash Rack System (Building 1007) located northeast of the northeast corner of Site C. Soil and groundwater samples were collected for chemical analysis and some compounds were detected above certain RBC and MDE cleanup standards. Arsenic was detected in soil at levels up to 17.8 mg/kg. TPH-Gasoline range Organics (GRO) was detected in groundwater at concentrations up to 6,910 µg/l. Benzene was detected in groundwater at concentrations up to 9.1 µg/l; the MDE Groundwater Standard is 5 µg/l and the RBC for tap water is 0.34 µg/l.

Additionally, Motor Pools may have been present southeast and northeast of Site C in the past. Since Site C is on a topographic high point, both of these Motor Pools would have been located downgradient of the site.

Due to the age of the current and former buildings on Site C, lead from paint may be present on the existing buildings and in site soil.

Natural resources constraints at Site C are limited to the designated FCA areas that are present along the eastern border of the site. Development at this site would need to comply with Maryland FCA requirements.

Due to the age of the current and former buildings on site and the potential for lead to be present in soil above action levels, the majority of Site C requires further study, placing it in ECOP category 7. Site soils in the vicinity of the current and former buildings have not been sampled for lead. The northwestern and southern portions of Site C would be classified in category 1, making it suitable for transfer. The northeastern of Site C, near where the old Motor Pool and current Equipment/Vehicle Storage Yard is located would score a 6 because chemical compounds were detected in soil and groundwater above action levels.

Although an old Motor Pool was located southeast of the southeastern portion of Site C, it was probably downgradient of Site C and therefore, probably would not have affected groundwater beneath Site C and would score a category 1.

Over the years, numerous barracks and a command center were constructed at Site L in support of World War II. Those barracks and the command center have been torn down. Currently, Site L is mostly open fields with a few scattered clumps of trees. In the past, Pistol Range A occupied a 4-acre parcel that extended into the northeastern corner of Site L. Pistol Range A had been given a relative explosives safety risk of 5, corresponding to a negligible explosives safety risk. An environmental study had been conducted of Building 2831, a former building on Site L. Building 2831 held x-ray processing units and a laboratory where chemicals were used and stored. Soil samples were collected for chemical analysis and arsenic was detected in soil above the residential and industrial RBCs. Arsenic was also detected above its expected regional background level.

Additionally, a motor pool may have been present east of the northeast corner of the site in the past. Because of the buildings located on this site in the past, lead may also be present in the soil as a result of LBP being used on the buildings.

Site L contains natural and cultural resources constraints. Two small FCA areas, one at the north end and one along the west-central border, would require compliance with Maryland FCA requirements. A historic cemetery, the Friedhofer & Gary Cemetery, occupies an approximately 40-foot by 40-foot area along the western border of Site L.

Due to the age of the former buildings on site and the potential for lead to be present in soil above action levels, the majority of Site L requires further study, placing it in ECOP category 7. Site soils in the vicinity of the former buildings have not been sampled for lead. The old Motor Pool located northeast of the site would contribute to the category 7 score in this part of the site. The area around former building 2831 would score a 6 because chemical compounds were detected in soil above action levels. The western portion of Site L would be classified in category 1, making it suitable for transfer.

Currently, the northern portion of Site S is a closed sanitary landfill and the southern portion is wooded. Firing ranges border the western and southwestern border of the site. Buildings that currently support range activities are located along the southwestern portion of this site. Over the years, Site S had been used as a training ground for cavalry and troops. Munitions reportedly had not been used in Training Area B, which is located in the northwest portion of Site S. However, around 1922 a machine gun range was noted in the southwest portion of the site. Ammunition Supply Points had been constructed in the central portion of the site but are no longer present.

The embankment for the abandoned Baltimore and Ohio Railroad runs through the northern part of the site and has the potential for contamination by Polynuclear Aromatic Hydrocarbons (PAHs) and other petroleum hydrocarbons, plus any spills that may have occurred.

Because of the age of the buildings formerly and/or currently on each of the sites, there is a possibility that LBP was used and may be present in the buildings or soil surrounding the buildings.

The landfill was constructed as an unlined facility and was managed as two cells. Numerous environmental studies had been conducted at Site S and the surrounding vicinity over the years. Soil, groundwater, and surface water samples had been collected for chemical analysis and some

compounds were detected above certain RBC and MDE cleanup standards. Most studies indicate that separate contaminants affect the upper and lower aquifers underneath Site S, and that the lower aquifer contaminants (including carbon tetrachloride) probably originate from other sources north and/or west of Site S. As part of the landfill closure requirements, periodic monitoring of groundwater quality currently is being conducted at Site S. The landfill is listed in the National Priorities List (NPL), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), Resource Conservation and Recovery Act (RCRA) Treatment, Storage, Disposal (RCRA TSD), RCRA Large Quantity Generators (LQG), and Records of Decision (ROD) databases.

A majority of Site S is designated as FCA and is subject to Maryland FCA development requirements. Designated FCA areas are present along the northern, southern and western boundaries of the site. Site S also contains three areas designated as critical habitat protection areas by the Department of the Army due to the presence of state rare and listed species: Rock Avenue Shrub Swamp, Range Road Obstacle Course, and Range Road Corridor. These designations were applied based on the current state and Federal rare, threatened, and endangered species lists at the time of designation. According to the 2003 list of Maryland rare, threatened and endangered species, the classifications have changed for several of the species of concern in the designated habitat protection areas. None of the previously identified species in these areas is legally protected with the state or Federal designation of threatened or endangered. The sites do contain plants included on the 2003 Maryland list as Watch List or Uncertain, which are designations that do not carry legal protection.

The Rock Avenue Shrub Swamp is the only true seasonally saturated/semi-permanent swamp present on FGGM and according to a 2001 Eco-Science report obtaining a permit for disturbance would be difficult (Eco-Science, 2001). Site S also contains numerous wetlands and open-water bodies. Disturbance of these areas would require permitting with Federal and state agencies and permit conditions would require avoidance, minimization, or mitigation of impacts.

Physical conditions that pose potential constraints on Site S include:

- The Phelps cemetery, containing five headstones, located in the southeastern portion of Site S.
- The methane-collection/venting system and methane vents installed within the landfill areas of Site S
- The presence of noise sources, which include the railroad, the adjacent railroad yard, and adjacent firing range.

Due to the age of the current and former buildings on site and the potential for lead to be present in soil above action levels, portions of Site S around these buildings requires further study, placing it in ECOP category 7 (these sites are not listed on the map). Site soils in the vicinity of the former buildings have not been sampled for lead.

Because studies have indicated the landfill may be affecting the shallow groundwater and surface water, the landfill would be placed it in ECOP category 6. Because studies indicate the deeper aquifer beneath Site S is affected by upgradient sources, the remainder of the site would be placed in category 6 also. The railroad grade in the northern portion of the site may require further study, placing it in category 7.

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ACRONYMS

ACM	Asbestos-Containing Material
amsl	Above mean sea level
ASL	Active Sanitary Landfill
ASP	Ammunition Supply Point
AST	Above-ground Storage Tank
ASTM	American Society for Testing and Materials
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cm/s	centimeters per second
CO	Carbon monoxide
COMAR	Code of Maryland Regulations
CSLF	Closed Sanitary Landfill
CTT	Closed, Transferring, and Transferred
dB	Decibel
DINFOS	Defense Information School
DMM	Discarded Military Munitions
DNL	Day-night level
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EBS	Environmental Baseline Survey
ECOP	Environmental Conditions of Property Classification
EDR	Environmental Data Resources
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
FCA	Forest Conservation Act
FGGM	U.S. Army Garrison Fort George G. Meade
FSD	Forest Stand Delineation
HAP	Hazardous Air Pollutant
IDW	Investigation Derived Waste
INRMP	Integrated Natural Resources Management Plan
LBP	Lead-Based Paint
LOC	Library of Congress
LQG	Large Quantity Generators
LUST	Leaking Underground Storage Tank
MC	Munitions Constituents
MCL	Maximum Contaminant Level

MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
mgd	Millions of gallons per day
mg/L	Milligrams per liter
MSWLF	Municipal Solid Waste Landfill
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Planned
NPL	National Priorities List
NO_2	Nitrogen dioxide
NRHP	National Register of Historic Places
NSA	National Security Agency
NWI	National Wetland Inventory
O_3	Ozone
OCP	Oil Control Program
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
pCi/L	picoCuries per Liter
PCB	polychlorinated biphenols
PCE	perchloroethene; tetrachloroethene
PM	Particulate matter
ppb	Parts per billion
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
REC	Recognized Environmental Condition
RI	Remedial Investigation
RK&K	Rummel, Klepper & Kahl Consulting Engineers
ROD	Records of Decision
RV	Recreational Vehicle
SHWS	State Hazardous Waste/Superfund
SMCL	Secondary Maximum Contaminant Levels
SO_2	Sulfur dioxide
SOW	Scope of Work
SQG	Small Quantity Generator
SRS	Sensitive Receptor Survey
STP	Sewage Treatment Plant
SVOC	Semi-Volatile Organic Compound

SWF/LF	Solid Waste Facilities/Landfill
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TAP	Toxic Air Pollutant
TCE	Trichloroethylene
TIC	Tentatively Identified Compound
TMP	Transportation Motor Pool
TPH	Total Petroleum Hydrocarbon
TSD	Treatment, Storage or Disposal
TSI	Thermal System Insulation
ug/L	Micrograms per liter
URS	URS Group, Inc.
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound

URS Group, Inc. (URS), under contract number W912DR-04-D-0003 with the U.S. Army Corps of Engineers (USACE), conducted an Environmental Baseline Survey (EBS) of four site areas at the U.S. Army Garrison Fort George G. Meade (FGGM), located in Anne Arundel County, Fort Meade, Maryland (Figure 1-1). The four areas, designated as Sites A, C, L and S, contain a total of approximately 438 acres. Sites A, C, and L are located in the eastern portion of FGGM, and Site S is located in the southeast corner of the base (Figure 1-2).

1.1 PURPOSE AND SCOPE

The purpose of this EBS is to determine the presence, or potential presence, of hazardous substances or petroleum products and to document existing natural and cultural resources at the four sites in support of future tenant activity. The EBS assesses the likelihood of a future release into structures or into the ground, groundwater, or surface water on the subject property based on current conditions on the subject sites and on neighboring properties. This EBS is intended to provide sufficient information to adequately identify the potential environmental contamination liabilities and potential natural and cultural resource constraints associated with real property acquisition, lease, transfer, or disposal.

This EBS was performed in accordance with Army Regulation 200-1 *Environmental Protection and Enhancement* (2000), Army Regulation 200-2 *Environmental Effects of Army Actions* (2000), and Department of the Army Pamphlet 200-1 *Environmental Protection and Enhancement* (2000). This EBS reflects the general scope and methodology as defined by the American Society for Testing and Materials (ASTM) Standard Practice D 6008-96 *Standard Practice for Conducting Environmental Baseline Surveys* (1996).

This EBS evaluates the environmental conditions at four sites on FGGM, including the existence of hazardous waste or toxic substance contamination and the potential threat to human health and the environment, and categorizes the sites according to seven Environmental Conditions of Property classifications (ECOP) as described in the following Department of Defense (DoD) Fall 1995 Base Realignment and Closure (BRAC) Cleanup Plan Guidebook (DoD, 1995).

Table 1-1: Environmental Condition of Property Area Types

Category	Description
1	Areas where no release or disposal of hazardous substances or petroleum products has occurred (including migration of these substances from adjacent areas).
2	Areas where only release or disposal of petroleum products has occurred.
3	Areas where release, disposal, and/or migration of hazardous substances have occurred, but at concentrations that do not require a removal or remedial response.
4	Areas where release, disposal, and/or migration of hazardous substances have occurred, and all removal or remedial actions to protect human health and the environment have been taken
5	Areas where release, disposal, and/or migration of hazardous substances have occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

Category	Description
6	Areas where release, disposal, and/or migration of hazardous substances have occurred, but required actions have not yet been implemented.
7	Areas that have not been evaluated or require additional evaluation.

Source: DoD, 1995

The scope of this EBS included a review of:

- Existing installation environmental documents.
- Reasonably obtainable Federal, state, and local government records.
- Aerial photographs.
- Historic maps and documents.
- Site conditions via conducting visual inspections and personal interviews.
- Natural and cultural resource information to support National Environmental Policy Act (NEPA) compliance for sites A, C, L, and S

1.2 LIMITATIONS OF THE STUDY

This EBS formulates an opinion on the environmental suitability of the sites for future actions relative to the environmental conditions of and concerns relative to the land, facilities, and real property at the sites. Opinions in this report relative to the potential recognized environmental conditions and physical and historical setting sources at the sites are based on information derived from site reconnaissance conducted during March and April 2005, and obtained from reasonably available information sources and personal interviews, all of which were assumed to be accurate and complete. Although this EBS was performed professionally and used the most current and reliable data, site conditions cannot be fully characterized or guaranteed based solely on the information presented herein. It is believed that the appropriate level of care and due diligence have been applied to justify the findings and recommendations of this report as it relates to the properties.

1.3 LOCATION AND SITE DESCRIPTIONS

The U.S. Army Garrison Fort Meade is located in Anne Arundel County, Maryland (Figure 1-1). FGGM consists of 5,415 acres with 65.5 miles of paved roads, 3.3 miles of secondary roads, and about 1,300 buildings (U.S Army, 2005).

Site A occupies about 36 acres of land located in the eastern portion of FGGM, west of Maryland Route 175 and south of Reece Road (Figure 1-3). The site is located east of Franklin Branch and extends from Reece Road south to an unnamed tributary of Franklin Branch. The proposed realignment of Ernie Pyle Road will form the eastern boundary of the site.

Site C occupies about 20 acres of land and is located near the eastern boundary of FGGM, north of Reece Road (Figure 1-3). The site is bounded on the west by Ernie Pyle Road and extends east almost to Maryland Route 175. The northern boundary parallels 20th Street, approximately

200 feet to the north and the southern boundary parallels 19th Street approximately 300 feet south of the street.

Site L is composed of about 32 acres and is located adjacent to and east of Site A, extending east to Chisholm Avenue (Figure 1-3). It is bordered to the north by Reece Road and to the south by 13th Street.

Site S is located in the southeast corner of the base and encompasses about 349 acres of land (Figure 1-4). It is shaped as a skewed pentagon. Rock Avenue forms the northern half of the northwestern boundary and the western half of the northern site boundary. Pepper Road and Magazine Road make up the southern half of the northwestern boundary. The eastern half of the northern site boundary is about 400 feet south of Odenton Road. Range Road (also known as Wildlife Loop) forms the western and southwestern boundary. The site is bordered to the southeast by Amtrak rail lines. The eastern boundary is bordered by commercial and undeveloped property.

This section describes the variety of methods used to document and survey the environmental conditions at each of the four sites reviewed for this EBS.

2.1 DOCUMENTS REVIEWED

A review of relevant files and documents for FGGM was conducted to obtain information about past and current uses of the sites, evaluate environmental conditions, and identify natural and cultural resources. Table 2-1 is a list of the primary documents reviewed.

Table 2-1: Documents Reviewed

Document Name	Author	Publication Date	Applicable Sites
Site Investigation Report, Building 2724, Solid Waste Management Units (SWMUs) 80 through 86	Versar, Inc.	December 7, 2001	Site A
Site Investigation Report, Wash Racks at Building 2728, SWMUs 87 through 92	Versar, Inc.	December 14, 2001	Site A
Draft Delineation Reports, Equipment Vehicle Storage Yard Wash Rack System (Building 1007)	Versar, Inc.	September 20, 2000	Adjacent to Site C
Volume II of II, Sampling Visits (23 Additional), Solid Waste Management Units	Versar, Inc.	June 7, 2000	Site L
U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) Groundwater Consultation, Initiation of Detection Monitoring Program	USACHPPM	March 23-June 30, 1994	Site S
Active Sanitary Landfill Atrazine Study	Arthur D. Little, Inc.	March 1999	Site S
Off-Post Drilling and Sampling Results and Surface Water Sampling Results	Arthur D. Little, Inc.	March 1999	Site S
Fort George G. Meade Off-Post and Sanitary Landfill Study, Final Groundwater Database Report	Malcolm Pirnie, Inc.	March 1999	Site S
Final Report of Results from May 2001 Sampling of Monitoring Well MW-4DR	IT Corporation	July 2001	Site S

Document Name	Author	Publication Date	Applicable Sites
Groundwater Remedial Investigation Work Plan Addendum	IT Corporation	November 2001	Site S
Closed Sanitary Landfill Groundwater Data Report	EM Federal Corporation	July 2003	Site S
Closed, Transferring, and Transferred (CTT) Range/Site Inventory Report	Malcolm Pirnie, Inc.	November 2003	Site S
Closed Sanitary Landfill, Site-Specific Addendum to the Generic Field Sampling Plan	EM Federal Corporation	December 2003	Site S
Initial Phase I Report, Site Assessment of 100-Acre Site, Library of Congress (LOC) Campus Facility	Rummel, Klepper, & Kahl	May 19, 1994	Adjacent to Site S
Final Summary Report, Source Area Delineation of Carbon Tetrachloride, Defense Reutilization and Marketing Office (DRMO) Facility	URS	February 2001	Adjacent to Site S
Final Work Plan, Remedial Investigation, LOC Facility	Malcolm Pirnie, Inc.	March and November, 2000	Adjacent to Site S
Remedial Investigation at the LOC Site, Volume I of II	Malcolm Pirnie, Inc.	March 2002	Adjacent to Site S
A Rare, Threatened, and Endangered Species Habitat Search (5 Year Update) at Fort George Meade	Eco-Science Professionals, Inc.	February 19, 2001	Sites A, C, L, and S
Final Integrated Natural Resource Management Plan, Fort George G. Meade, Maryland 1994 to 2004	CH2M HILL	1999	Sites A, C, L, and S
Aerial Photographic Analysis, Fort George Meade - Cantonment Area, Anne Arundel County, Maryland	U.S. Environmental Protection Agency (EPA)	March 1996	Sites A, C, L, and S

2.2 SITE RECONNAISSANCE

URS personnel conducted an on-site reconnaissance of the subject properties during March and April 2005. The site visits were performed using teams of qualified environmental professionals. FGGM personnel were available during the site visits to allow URS personnel access to the interior of buildings on the sites and to answer questions dealing with site history. Selected photographs taken during the site visits are included in Appendix A.

2.3 INTERVIEWS

Interviews with key facility employees and Army personnel were conducted to aid in the identification of environmental conditions at the subject properties. Summaries of the interviews are included in Appendix B. The follow list summarizes the personnel interviewed and the topics discussed.

List of Interviewees:

Name	Item(s) Discussed or Assistance Provided
Ms. Heather Carolan	Provided information on natural resources and provided contacts who were able to answer environmental questions regarding the sites.
Mr. Bob Johnson	Provided historic maps of the base.
Mr. Balwant Sharma	Provided asbestos reports for existing structures.
Ms. Alice Ginter	Provided contacts for access to locked buildings and background information on past use of sites.
Sgt. Wilson	Assisted with access to buildings in the 900 block.
Sgt. Gamble	Assisted with access to Building 979 and answered questions about uses of locked rooms and locked large containers.
Mr. Washington	Assisted with access to Building 998 and answered questions about uses of locked rooms.
Cpl. Jason Carlic	Assisted with access to Building 968 and answered questions about uses of locked rooms.
Sgt. McMullen	Assisted with access to buildings on the southern portion of Site S, near the firing ranges.
Mr. Don Marquardt	Provided information regarding Site S.
Mr. Roger Francis	Provided information regarding bald eagle presence at Site S.
Mr. Dave Kandt	Provided information regarding polychlorinated biphenyl (PCB) content of transformers on the sites.
Ms. Patricia Moore	Provided access to Building 2724 on Site A.
Mr. Lapinsky	Provided information regarding Building 2724 on Site A.

2.4 HISTORICAL TOPOGRAPHIC MAPS REVIEWED

Historical topographic maps were accessed either through Environmental Data Resources, Inc. (EDR), an independent data and database research firm, or through the museum office at FGGM. These maps were reviewed to evaluate past land uses and environmental features at the four sites. Table 2-2 provides a list of the topographic maps obtained and reviewed for this EBS. Copies of the historic topographic maps reviewed are provided in Appendix C.

Table 2-2: Historical Topographic Maps Reviewed

Map Date	Source	Applicable Sites
1917	museum office	A, C, L
1922	museum office	A, C, L, S
1938	museum office	A, C, L, S
1949	EDR	A, C, L, S
1957	EDR	A, C, L, S
1970	EDR	A, C, L, S
1976	museum office	A, C, L, S
1979	EDR	A, C, L, S

In addition, a 1919 land acquisition map and a land use map dating from probably around World War II were reviewed. Both were provided by the museum office and covered sites A, C, L, and part of S.

2.5 HISTORICAL AERIAL PHOTOGRAPHS REVIEWED

Historical aerial photographs of FGGM were reviewed to evaluate past land uses at each of the sites. A list of aerial photographs reviewed for this study is provided in Table 2-3. Copies of the aerial photographs reviewed are provided in Appendix D.

Table 2-3: Historical Aerial Photographs Reviewed

Aerial Photograph Date	Source	Applicable Sites
1957	EDR	A, C, L, S
1963	EDR	A, C, L, S
1970	EDR	A, C, L, S
1980	EDR	A, C, L
1988	EDR	A, C, L, S

Additional aerial photographs covering the years 1938, 1943, 1947, 1952, 1957, 1963, 1970, 1975, 1988, and 1995 were available for review from a 1996 report produced by the U.S. Environmental Protection Agency (EPA) (EPA, 1996).

2.6 EXISTING DATABASE SEARCHES

Agency records were accessed through EDR. Databases were queried on the search distances recommended by ASTM D6008-96, the ASTM standard Practice for Conducting an EBS

(ASTM, 1996) and on ASTM E 1527-00, the ASTM Standard Practice for Environmental Site Assessments, Phase I Environmental Site Assessment Process (ASTM, 2000). Table 2-4 provides a list of the environmental databases that were included in the EDR search. Copies of the EDR reports generated for Sites A, C, L, and S are provided in Appendix E.

Table 2-4: Environmental Database Summary for Sites A, C, L, and S at FGGM, Maryland

Type of Database/ Date	Description of Database/Effective Date	Radius Searched
NPL	The National Priorities List (NPL) identifies uncontrolled or abandoned hazardous waste sites. To appear on the NPL, sites must have met or surpassed a predetermined hazard ranking system score, been chosen as a state's top priority site, pose a significant health or environmental threat, or be a site where the EPA has determined that remedial action is more cost-effective than removal action. Effective Date – 12/04	1.25 mile
CERCLIS	The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database identifies hazardous waste sites that require investigation and possible remedial action to mitigate potential negative impacts on human health or the environment. Effective Date – 12/04	0.75 mile
CERCLIS-NFRAP	No Further Remedial Action Planned (NFRAP). As of February 1995, CERCLIS sites designated as NFRAP have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. Effective Date – 12/04	0.50 mile
RCRIS TSD	Resource Conservation & Recovery Information System (RCRIS) Treatment, Storage, or Disposal (TSD) sites Effective Date – 11/04	0.75 mile
CORRACTS	Listing of RCRA facilities that are undergoing corrective action. Corrective actions may be required beyond the facility's boundary and can be required regardless of when the release occurred, even if it predates RCRA. Effective Date – 12/04	1.25 mile
RCRIS Large Quantity Generators	RCRA-regulated hazardous waste generator notifiers list. Effective Date – 11/04	0.50 mile
RCRIS Small Quantity Generators	RCRA-regulated hazardous waste generator notifiers list. Effective Date – 11/04	0.50 mile
ERNS	EPA's Emergency Response Notification System (ERNS) list contains reported spill records of oil and hazardous substances. Effective Date – 12/03	0.25 mile

Type of Database/ Date	Description of Database/Effective Date	Radius Searched
SHWS	State Hazardous Waste/Superfund (SHWS) permanent list of priorities. Effective Date – 9/03	1.25 mile
SWF/LF	Solid Waste Facilities/Landfill Sites (SWF/LF). Effective Date – 4/04	0.75 mile
OCP Cases	Cases monitored by the Oil Control Program (OCP) that include leaking underground storage tanks and other below ground releases, leaking aboveground storage tanks, spills, and inspections. Effective Date – 10/04	0.75 mile
Historical LUST	List of information pertaining to all reported leaking underground storage tanks (LUST). Effective Date – 03/99	0.75 mile
UST	State underground storage tank (UST) sites listing. Effective Date – 11/04	0.50 mile
VCP	Voluntary Cleanup Program (VCP) Sites. Effective Date – 10/04	0.75 mile

2.7 SANBORN MAPS

The Sanborn Map Company of Pelham, New York, produced a uniform series of large-scale maps, dating from 1867 to the present, that were designed to assist fire insurance agents in determining the degree of hazard associated with a particular property. The maps provide a source of historical information about the structure and use of buildings, and are typically a valuable source of information when preparing EBSs.

According to EDR, Sanborn maps were not available for the FGGM area (EDR, 2005j, 2005k, and 2005l; Appendix F).

3.1 CLIMATOLOGY

FGGM is located in the continental climate zone of the eastern United States. This climate region is typified by mild winters and summers that are long, warm, and often humid as a result of persistent maritime tropical air. Temperate weather prevails in the spring and summer.

Annual temperatures in the region range from less than -6 degrees Fahrenheit (°F) in winter to highs over 100°F in summer. FGGM's annual mean temperature is 61°F with daily average highs of 71°F and a minimum of 45°F. The average annual precipitation is 41 inches (including 22 inches of snow). Strong thunderstorms throughout the summer cause the greatest amount of rainfall. These occur mainly during August (USACE, 2004).

3.2 TOPOGRAPHY

In general, the topography of FGGM is characterized by flat land that gently slopes toward scattered water bodies throughout the base. Local small-scale variations in elevation are abundant. Much of the base topography has been altered by development. The highest elevation is about 300 feet above mean sea level (amsl) in the northwest corner of the base. The lowest elevation at FGGM is under 100 feet amsl, which occurs in the southwest corner of FGGM along the Little Patuxent River (CH2M HILL, 1999).

3.3 GEOLOGY AND SOILS

FGGM is located on the unconsolidated sands, clays, and silts of the Atlantic Coastal Plain physiographic province. The Coastal Plain is characterized by a low, broad plain on an unlithified, eastward-thickening wedge of sediments dipping gently to the southeast. These sediments were deposited on Precambrian crystalline rocks that are exposed west of the Fall Line, the boundary between the Coastal Plain and Piedmont provinces which runs several miles to the west of FGGM. Thickness of the Coastal Plain sediments (or depth to the crystalline bedrock) ranges from zero at the Fall Line, the western boundary of the Coastal Plain, to over 10,000 feet at the coast line.

Cretaceous sediments of the Potomac Group constitute the Coastal Plain sediments at FGGM. This group consists of, from youngest to oldest, the Patapsco, Arundel, and Patuxent Formations, and has a total thickness of approximately 600 feet in the vicinity of the Post. These formations were formed as fluvial and lacustrine deposits and include sands with interbedded gravel, silt, and clay layers.

The Patapsco Formation has been subdivided into upper, middle, and lower units. The upper Parapsco is thickest, approximately 40 feet, at the east side of FGGM, and thins to an erosional edge on the west side of the Post. This upper unit consists of mottled, medium fine sand to silty sand, usually yellow-brown, yellow-orange, light brown, or gray in color. Rare intercalated beds of clay and gravel are present. This is the water table aquifer on the southeastern portion of FGGM.

The middle Patapsco unit consists of a thick, hard, highly plastic, mottled, reddish-brown to light gray colored clay. This unit has an average thickness of 50 feet with a maximum thickness of 102 feet recorded on the post. Very fine silty sand lenses, 2 to 16 feet in thickness, are present

throughout the middle unit, while an intercalated black coal seam was encountered in the lower section of the middle Patapsco unit. This unit outcrops to the west of the erosional limit of the upper Patapsco.

The lower Patapsco unit consists of medium fine silty sand that grades vertically to a coarse sand with minor silt. This unit's color varies from pale to dark yellow-orange, dark brown, and dark yellow. The transition between the middle and lower unit is very gradual, marked by alternating silty sands and silty clays. The regional thickness of this unit ranges from 80 to 100 feet. For most of FGGM the lower Patapsco is a confined aquifer.

The Arundel Formation is approximately 250 feet thick (Mack and Achmad, 1986). This formation consists of massive beds of red, brown, and gray clay with several more permeable interbeds. The Patuxent Formation underlies the Arundel Formation and overlies crystalline bedrock. The Patuxent Formation is composed principally of sand and gravel with minor amounts of silty clay and clay.

Bedrock in the vicinity of FGGM consists of igneous and metamorphic crystalline rocks of Precambrian to early Cambrian age. These are the crystalline rocks that are exposed at the Fall Line which, in the vicinity of FGGM, lies close to Interstate Highway 95.

Soil types found in the FGGM vicinity belong to two major associations. Most of the area is comprised of the loamy and clayey land of the Muirkirk-Evesboro soil association and the remaining soils are of the Evesboro-Rumford-Sassafras association (E.M. Federal Corporation, 2004).

The Muirkirk-Evesboro soils comprise underdeveloped forestland and some portions of the developed sections. These soils are loamy and clayey, underlain by unstable clay of low permeability. This association primarily supports a mixture of pine and hardwood vegetation.

The Evesboro-Rumford-Sassafras soils usually have an unstable and slowly drained substratum that seasonally enhances a high water table. The Evesboro series is characterized by coarse, loose, and drought soils with clayey substratum of low permeability. The Rumford series is composed of loose loamy soils with sandy loamy subsoil. The Sassafras series consists of fine sandy loamy material overlain on sandy-clayey-loamy subsoil.

3.4 HYDROGEOLOGY

Three distinct aquifers are present in the unconsolidated sediments beneath FGGM, the upper and lower Patapsco and the Patuxent aquifers (Figure 3-1). Each of these units is dominantly sand with some silty and clayey interbeds. Two distinct confining layers separate the three aquifers. The middle Patuxent clay unit separates the upper and lower Patapsco aquifers. The Arundel Formation is the aquitard that separates the lower Patapsco and the Patuxent aquifers.

The upper Patapsco aquifer, which is limited to the southeastern part of FGGM, is an unconfined water-table aquifer. Here, the topography controls surface water movement and influences the groundwater flow in the water table aquifer. At the closed landfill, groundwater flow follows the surface drainage toward the center of the site and then southwestward across the wetlands as the surface stream exits Site S and flows under Range Road. A north-south oriented groundwater divide at the Amtrak right-of-way separates the water table groundwater flow regime at Site S from the water table groundwater flow east of FGGM.

The lower Patapsco and Patuxent aquifers are in confined conditions under most of FGGM. On part of the northern Post, the lower Patapsco aquifer crops out and water table conditions prevail. Patuxent sands outcrop west of Route 295, the Baltimore-Washington Parkway. Regionally, the groundwater in these aquifers flows to the southeast toward the Chesapeake Bay, although minor local flow variations are encountered.

Groundwater elevations have been measured in both the upper and lower Patapsco aquifers during environmental sampling events near the closed landfill. Measurements made in September 2004 are the basis of the present discussion. Figure 3-2 presents the resulting groundwater contour map in the water table upper Patapsco aquifer. Arrows show the interpreted direction of groundwater flow, with the groundwater in the landfill area flowing in the direction of the surface drainage. Figure 3-3 presents the contoured potentiometric surface in the confined lower Patapsco aquifer. This surface shows the general southeastward groundwater flow direction in the deeper aquifer. Of particular interest is the water elevation difference between the upper and lower aquifers – the middle Patapsco clay is separating approximately 60 feet of negative head difference. This suggests the middle Patapsco is an effective confining layer for the lower Patapsco aquifer in the vicinity of the landfill.

Hydraulic conductivity is the parameter that characterizes the ability of groundwater to flow through porous material. The following table presents the conductivities that have been reported from various well investigations for the two Patapsco aquifers and the two confining units. The great range of this parameter requires the exponential format to compare the flow in the highly productive aquifers to the almost impenetrable confining units.

Table 3-1: Hydraulic Conductivity - Potomac Group Sediments, FGGM, Maryland

Aquifer Unit	**Conductivity (cm/s)**
Upper Patuxent	3×10^{-5} to 6×10^{-3}
Lower Patuxent	4×10^{-4} to 2×10^{-3}
Confining Unit	**Conductivity (cm/s)**
Middle Patuxent	1×10^{-8} to 2×10^{-7}
Arundel Clay	2×10^{-10}

cm/s = centimeters/second

Based on the gradients from the September 2004 measurements, the average conductivities for the aquifers, and an assumed 25 percent aquifer porosity, groundwater velocity in the upper Patapsco is approximately 18 feet per year and approximately 31 feet per year in the lower Patapsco.

3.5 WATER RESOURCES

FGGM is located in the Little Patuxent River Watershed. The Little Patuxent River flows to the southeast and is located southwest of the base. Several tributaries on FGGM flow into the Little Patuxent River.

Midway Branch flows north to south through the middle of the base and drains most of the middle and western portions of the base. Franklin Branch flows to the south, is located in, and drains most of, the eastern portion of the base. Franklin Branch flows through Kelly Pool (also called Burba Lake) before connecting with Midway Branch. Midway Branch eventually enters Soldier Lake (also called Allen Lake), located south of the base and south of Maryland Route 32 before entering the Little Patuxent River.

Other unnamed tributaries drain the remainder of the western portion of the base. These tributaries flow into the Little Patuxent River. Kelly Pool (also called Burba Lake) is the only enclosed water body on the base, not including several stormwater management ponds (CH2M HILL, 1999).

Drainages are generally flat and wide. Marshy lands occur along portions of the Patuxent and Little Patuxent Rivers. Both rivers are mature and their floodplains in the vicinity of FGGM are meandering and fairly level topographically.

The Little Patuxent River water quality is generally poor. Several significant discharges occur to the river upstream of FGGM, including the Johns Hopkins University Farm, W.R. Grace, Co., The University of Maryland Farm, the Maryland House of Corrections Sewage Treatment Plant (STP), and the Savage STP. High bacteriological and viral counts, associated primarily with STP effluent, are the main sources of contamination. Other sources of bacteria include discharges from faulty septic tank systems, on-post STPs, and runoff from urban and agricultural areas. Suspended solids, turbidity, and phosphorus and nitrogen loading also contribute to the degradation of the Little Patuxent River. The most significant discharge that affects FGGM comes from the Savage STP (EM Federal Corporation, 2004).

3.6 AIR QUALITY

The U.S. Environmental Protection Agency has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, which are called “criteria” pollutants. They include: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), lead (Pb), particulate matter less than or equal to 10 microns (PM_{10}) and 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2). The Maryland Department of the Environment (MDE) Air and Radiation Management Administration administers Federal and State air quality regulations statewide. FGGM is located in Maryland Air Quality Control Region 3.

Title V of the Clean Air Act (CAA) establishes thresholds for criteria pollutants. Anne Arundel County is in severe non-attainment for 1-hour and 8-hour O_3 and in attainment for all other criteria pollutants. The air quality monitoring station located on Y Street at FGGM has been monitoring criteria pollutants since 1983. The NAAQS peak hourly attainment threshold for O_3 is 125 parts per billion (ppb). From 1996 until 2001, FGGM exceeded this threshold 16 times. Each occurrence happened from June through August (MDE, 2005).

A methane collection system was installed in the landfill at Site S as part of the landfill closure process. During the site visit in March 2005, methane vent pipes were observed throughout the closed and capped landfill cells, and a methane flare was observed in a fenced enclosure located at the northeast corner of Site S that also houses a methane collection tank.

3.7 NOISE

Noise is defined as unwanted or unwelcome sound. Sound is measured in decibels (dB) on the A-weighted scale, corresponding to the range of human hearing. The EPA sets guidelines that state outdoor sound levels in excess of 55 dB day-night level (DNL) are "normally unacceptable" for noise-sensitive land uses such as residence, schools, and hospitals. The maximum permissible levels for workers in high noise areas vary by exposure time and dB.

3.7.1 Sites A, C, and L

The majority of noise at these sites is created by vehicular traffic. At Site A, noise is generated by the recreational facilities.

3.7.2 Site S

Site S has several noise sources. The site is bordered to the south by rail lines. Amtrak operates daily along these tracks and many trains pass through the area. Amtrak also operates a maintenance yard opposite the southeastern boundary of Site S. Activities at the maintenance yard generate a substantial amount of noise that is typical of train operations. Noise is also generated from a firing range located along the southwestern border of Site S. Noise levels vary with use, but could be constant throughout the day. Vehicular traffic in Site S is a minor source of noise, and vehicular traffic noise from Maryland Route 32 can be heard in the northernmost areas of the site.

3.8 PLANT AND ANIMAL ECOLOGY

FGGM is extensively developed but retains several forested areas. The upland forested areas are uniform across the sites and consist of a red oak/pine mix. Except for corridors along several streams, the installation provides little high-quality habitat for most species. Most wildlife species found at FGGM are those associated with urban-suburban areas: white-tailed deer, gray squirrel, beaver, raccoon, opossum, eastern chipmunk, field mouse, vole, mole, and fox.

Bird species found at FGGM are those that have adapted to the urban-suburban habitat of the base. Common birds include the American robin, catbird, Carolina chickadee, house wren, Carolina wren, mockingbird, common flicker, house sparrow, rock dove, morning dove, downy woodpecker, and song sparrow (CH2M HILL, 1999). Some migratory birds, such as raptors and warblers, use the post for feeding but do not seem to breed at the base. Four migratory birds either observed or heard at FGGM are listed on the Maryland Watchlist for Breeding populations: sharp-shinned hawk, spotted sandpiper, northern waterthrush, and northern junco (Eco-Science Professionals, Inc., 2001)

3.8.1 Sites A, C, and L

All three sites are heavily disturbed and have similar vegetation, which consists of cultivated mowed grasses with patches of trees. Grasses include bluegrasses (*Poa* spp.), fescues (*Festuca* spp.), and crabgrass (*Digitaria* spp.), and trees include red oak (*Quercus rubra)* and virginia pine (*Pinus virginiana)* (Appendix A.1, Photographs NR-A1, NR-A-2, NR-C1 to C5, NR-L1 to L4).

3.8.2 Site S

The western and northern sections of Site S consist of two distinct biological communities; a wetland community which is discussed in Section 3.12.9, and an upland oak/pine mix. The dominant vegetation includes pin oak (*Quercus palustris),* white oak (*Quercus alba),* red oak, virginia pine, pitch pine (*Pinus rigida),* and mockernut hickory (*Carya tomentosa).*

A small pond located east of Range Road has been expanded in surface area by a beaver dam constructed out of the pond outfall. The pond contains wood duck boxes, which hooded mergansers are known to use occasionally for nesting.

During a URS site visit in March 2005, a pitch pine tree was identified in the southwestern corner Site S (Appendix A.1, photograph NR-S10) with a sign designating it as a "research tree." Discussions with base personnel indicate that there is a known pitch pine "super tree" at Site S that is, or has been, used for seed collection by the State of Maryland (Marquardt, pers. comm.). No other information on the tree or research program could be found. URS personnel conducting water sampling activities on site have reported seeing other trees with this sign, but no others were located during the March and April 2005 site visits.

3.9 THREATENED AND ENDANGERED SPECIES

Under the Endangered Species Act, the U.S. Fish and Wildlife Service (USFWS) identifies plants and wildlife to be listed on the Federal threatened and endangered species list. No federally listed or proposed species are known to occur on Sites A, C, L, or S (CH2M HILL, 1999).

States determine the legal status of a species by regulations. In Maryland, species are given protection by inclusion on the State Threatened and Endangered Species List (Code of Maryland Regulations [COMAR] 08.03.08). Not all species listed by the Maryland Wildlife and Heritage Division have been granted legal protection. No state legally protected species are known to occur on any of the sites. A Rare, Threatened, and Endangered Species habitat search was conducted between August 1993 and August 1994, and again between March 2000 and November 2000 (Eco-Science Professionals, Inc., 2001). Changes in State status have occurred for some species since preparation of the 2001FGGM Rare, Threatened, and Endangered Species Report by Eco-Science Professionals. A summary of the State Species of Concern identified at Sites A, C, L, and S is provided below.

3.9.1 Site A, C, and L

These sites are heavily disturbed. There are no records of threatened and endangered or Maryland Watchlist species at these sites.

3.9.2 Site S

A pair of bald eagles (*Haliaeetus leucocephalus*) has been observed in flight over Site S during the past year by FGGM personnel. The eagles have been observed on an infrequent basis and there are no known nesting sites at Site S (Francis, pers. comm.). However, there are several known nesting sites in the vicinity of FGGM.

Nine plant species of state special concern are known to occur within the boundaries of Site S. The following discussion describes information for those species.

Purple chokecherry (*Aronia prunifolia)* – This shrub is state-listed as Watch List, a species that is rare to uncommon. Located in a seasonally saturated to semi-permanent shrub/emergent wetland, it lies within a mixed oak/pine forest southeast of Rock Avenue and north of the closed landfill.

Downy bushclover *(Lespedeza stuevei)* – State-listed as Watch List, this plant was present east of the abandoned storage building on the east side of Range Road, south of the beaver pond.

Roughish panicgrass *(Panicum leucothrix)* – This plant is given the state status of Uncertain. It was located along the Range Road obstacle course. The number of individuals decreased from a 1993 survey to a 2001 survey conducted by Eco-Science Professionals.

Tall boneset (*Eupatorium altissimum)* - Given a state status of Rare, tall boneset is found in open woods and clearings. It prefers dry open areas, old fields, open woodlands, roadsides, and disturbed sites that have been intensively grazed.

Shortleaf pine (*Pinus echinata)* - Shortleaf pine is listed as Secure, though it may be limited to specific areas of Maryland. It is found on dry, light soils, but can occur in a wide variety of habitats in the southeastern United States.

American chestnut *(Castanea dentata)* - The American chestnut, state listed as Rare to Watch List, is commonly found on mountains, hills and slopes in gravelly or rocky well-drained glacial soils.

Pussy Willow (*Salix discolor)* - Pussy willow is found in swamps, fens, stream banks, floodplains, marsh borders, ditches and other wet habitat. Its status is Uncertain in Maryland.

Grass Leaved Arrowhead (*Sagittaria graminea)* – Grass-leaved arrowhead is an immersed annual or perennial emergent plant often found in shallow waters of ponds, marshes, ditches, and on their wet shores. Its status is Uncertain in Maryland.

Prairie Cinquefoil (*Potentilla arguta)* - Prairie cinquefoil is found in dry woods and prairies, rocky, brushy, or alluvial soils. It is also located in disturbed areas such as limestone quarries and sand and gravel pits. Its status is Uncertain in Maryland.

3.10 PROTECTION AREAS

3.10.1 Critical Habitat Protection Areas

There are five designated critical habitat protection areas at FGGM. These areas were designated as protection areas by the Department of the Army due to the presence of state rare and listed species (Eco-Science, 2001). Three of the protection areas are located in Site S: Rock Avenue Shrub Swamp, Range Road Obstacle Course, and Range Road Corridor (Figure 3-5).

The boundary of the Rock Avenue Shrub Swamp includes a shrub swamp, headwater wetland area, and a 100-foot wetland buffer. This area is a seasonally saturated/semi-permanent shrub swamp. It is located south of Rock Road. Shrub species in this area include purple chokeberry (*Aronia prunifolia)* , southern wild raisin (*Viburnum midum*), smooth winterberry (*Ilex laevigatte*), sweetbay (*Magnolia virginiana*), and swamp azalea (*Rhododendron viscosum*).

There are numerous sedges (*Carex* spp.), cinnamon fern (*Osmunda cinnamomea*), and rice cutgrass (*Leersia oryzoides*) in the area. The headwater area consists of a red maple forested wetland with follicle sedge (*Carex folliculate*) and cinnamon fern. The lower end of the swamp drains into a temporary forested wetland (Eco-Science, 2001). The 2001 Rare, Threatened, And Endangered Species report (Eco-Science, 2001) listed three special status species for this area: purple chokeberry, stellate sedge *(Carex radiata),* and weak stellate sedge *(Carex seorsa).* According to the 2003 Maryland list (MDNR, 2005b), purple chokeberry is currently the only listed species. The 2001 report listed it as Endangered but the 2003 Maryland ranking provided is Watch List. According to the 2001 Eco-Science report, the Rock Avenue Shrub Swamp is the only true seasonally saturated/semi-permanent swamp present on FGGM, and as such, obtaining a permit for disturbance would be difficult.

The Range Road Obstacle Course Area consists of the obstacle course east of Range Road, a woodland path east of the obstacle course, and the woods within and immediately adjacent to the obstacle course. This area is primarily dry, sandy, open habitat surrounded by mixed pine/hardwood forests. Wet pockets occur in depressions around the area. The 2001 Eco-Science report listed three state-ranked plants for this area. However, only roughish panicgrass *(Panicum leucothrix),* appeared on the 2003 Maryland list and was listed as Uncertain (MDNR, 2005b). Common plants in this protection area include: sweet goldenrod (*Solidago odora*), Swan's sedge (*Carex swanii*), numerous thoroughworts (*Eupatorium rugosum*, *Eupatorium serotinum*), tickle grass (*Agrostis hyemalis*), and panicled tick-trefoil (*Desmodium paniculatum*) (Eco-Science, 2001).

The Range Road Corridor consists of portions of a forest/field complex that begins south of the Range Road pond and extends south/southeast about 0.25 mile. This protection area includes several interspersed habitat types including a mixed hardwood/pine forest, fields, and woods dominated by native and exotic herbaceous species, a shrub-dominated clearing in the woods, portions of a drainage ditch along the road, and an old woodland clearing behind an existing storage shed. Five species of plants with state status were identified in this area in the 2001 Eco-Science report: downy bushclover *(Lespedeza stuevei),* shaved sedge, eastern sedge *(Carex atlantica),* Asa Gray's cyperus *(Cyperus grayi),* and dwarf azalea *(Rhododendron atlanticum).* Downy bushclover is the only species present on the 2003 Maryland list and it is ranked Watch List (MDNR, 2005b).

3.10.2 Forest Conservation Act Areas

The current Integrated Natural Resources Management Plan (INRMP) for FGGM (CH2MHILL, 1999) identifies numerous areas at FGGM that have been designated as Forest Conservation Act (FCA) areas. FCA areas are identified within and adjacent to Sites A, C, and S as shown on Figures 3-4 and 3-5. FGGM voluntarily supports the Maryland FCA and complies with the Act on a case-by-case basis (CH2MHILL, 1999). The FCA applies to all activities requiring a permit for subdivision, grading, or sediment control that is larger than 40,000 square feet, or slightly less than 1 acre. The FCA provides guidelines for the amount of forest land retained or planted after the completion of development projects. These guidelines vary for each development site and are based on land use categories. FCA areas identified for disturbance require a Forest Stand Delineation (FSD) in compliance with the Maryland Forest Conservation Manual and a plan for conserving the most valuable portions of the forest. To comply with the Maryland FCA, dominant indigenous trees should be preserved and protected and 25-meter stream buffers should

be maintained (Colianni, pers. comm.). In addition, land development projects should be designed to Low Impact Development Standards to further protect natural resources.

3.11 WETLANDS

On-site wetlands were identified through site investigations and existing mapping, including a review of the National Wetland Inventory (NWI) maps and wetland mapping provided by FGGM. The presence and composition of wetlands noted within the subject areas on existing mapping were field-verified. Observations were recorded of additional areas not included on the mapping that appeared to support wetland ecologies. The boundaries of these areas were approximated and are indicated on Figure 3-5 as "potential" wetland areas. No wetland delineations were conducted for this EBS. Several small depressional areas, all less than approximately 0.01 acre, were observed throughout Site S. One of these small wetlands, dominated almost entirely by common reed (*Phragmites australis)*, was observed in Site L. Small depressional areas were also observed on the landfill within Site S. These areas are characterized by common reed and cattails (*Typha spp.)* and appear to have developed because of landfill cap grading.

3.11.1 Site A, C, and L

No wetlands were observed during the site visit, nor indicated on the available maps on Site A, C, or L. There is a small depressional area at the north end of Site L (Appendix A.1, photograph NR-L4) that is dominated by wetland vegetation (common reed). The isolated area is not depicted on any of the wetland mapping.

3.11.2 Site S

Ten wetlands were identified on the NWI mapping for Site S (Figure 3-5). Located in the northwestern portion of Site S is a 5.02-acre Palustrine Broadleaf Forested Seasonally Flooded Wetland (PFO1C). This wetland is dominated by red maple (*Acer rubrum)*, sweetgum (*Liquidambar styraciflua)*, pitch pine (*Pinus rigida)* and sweet pepper bush (*Clethra alnifolia).* Immediately to the east of the PFO1C wetland is a 0.34-acre Palustrine Forested Semi-permanently Flooded Impounded Wetland (PFO5Fh) with a significant number of standing dead trees. Another PFO1C wetland, 0.46 acre in size, is located immediately to the southeast of the PFO5Fh wetland.

The large PFO1C wetland extends to the south, though it is disjointed by the utility line easement that runs east to west across the northern portion of Site S. The portion of the PFO1C wetland to the south of the utility easement is 2.34 acres in size, and transitions into a 1.17-acre Palustrine Broadleaf Deciduous Scrub-Shrub/Emergent Semi-permanently Flooded/Saturated Impounded Wetland (PSS1/EM1Eh) that is dominated by red maple, sweet gum, river birch *(Betula nigra),* sycamore *(Platanus occidentalis),* sweet pepperbush, greenbrier *(Smilax hispida), Japanese* honeysuckle *(Lonicera japonica),* and arrow-leaved tearthumb *(Polygonum sagittatum).* A 0.84-acre PFO1C wetland lies immediately to the east. All of these wetlands flow to the west and southwest into a 0.87-acre Freshwater Pond Wetland (PABHh) that is visible from the entrance road. Beaver activity was observed in and around these wetlands; this coincides with the NWI "impounded" classification.

There are two small PABHh wetlands mapped by the NWI in the central portion of Site S (Figure 3-5). These wetlands are recorded by the NWI as being 0.37 acre and 0.25 acre in size. However, two separate wetlands were not observed in this location during field investigations, but rather a single, large freshwater pond was observed (Appendix A, photograph S3). To the southeast of this pond, a 5.64-acre Palustrine Broadleaf Forested Temporarily Flooded Wetland (PFO1A) is depicted on the NWI map (Appendix A.1, photograph NR-S7). This PFO1A wetland corresponds to a forested wetland dominated by red maple, sweetgum, pitch pine, sweet pepperbush, and greenbrier, observed during site visits.

Maps provided by the FGGM Environmental Management Office depict wetland areas within Site S not identified by the NWI map. In addition to depicting roughly the same wetland boundaries as the NWI map, the FGGM mapping also depicts two wetlands in the southwest portion of Site S (Figure 3-5), south of the large impounded wetland complex. In the March and April 2005 field visits, the location of these mapped wetlands was confirmed. Both wetlands were observed to be Palustrine Broadleaf Forested wetlands with small braided ephemeral stream channels running throughout, and both are dominated by red maple, swamp white oak (*Quercus bicolor),* sweet gum, pitch pine, sweet pepper bush, and greenbrier.

Site investigations further revealed the presence of potential wetland areas not previously identified on available FGGM wetland maps. These two areas, identified on Figure 3-5 as "potential wetland" areas, appear to be associated with signs indicating them as "Wetland Mitigation Areas," though in one area the sign was located some distance away from the apparent wetland boundary. Though a full wetland delineation was not conducted, evidence of the three wetland criteria—hydrology, hydrophytic vegetation, and hydric soils—was noted in both areas.

One of the potential wetlands is located at the bottom of the slope of Cell 1, and is bordered to the north by the road that lies to the north of Cell 1. Because of this, much of the north end of the potential wetland area is characterized by asphalt fill and gravel. This wetland area is a Palustrine Emergent wetland dominated by common reed and soft rush (*Juncus effusus).*

The other potential wetland area is located in the central portion of Site S, north of the 5.64-acre PFO1A wetland (Figure 3-5). The source of the hydrology of this wetland area appears to be discharge from a culvert connecting the landfill detention pond to the wetland area. Effluent from this culvert is further conveyed to the west by a small stream that eventually flows into the large PABHh pond in the center of Site S. The east side of this wetland was observed to be a Palustrine Broadleaf Forested wetland dominated by red maple, black willow (*Salix nigra),* sweet gum, pitch pine, and greenbrier, while the west side is a Palustrine Scrub-Shrub wetland dominated by common reed, cattails, and black willow.

3.12 HISTORICAL AND CULTURAL RESOURCES

In total, 71 archaeological sites have been identified within 2 miles of the center of FGGM. Prehistoric sites range in date from Early Archaic through the Late Woodland Periods; they include lithic scatters and resource procurement sites, base camps and other campsites, and a burial. Historic sites date from the late seventeenth century through the early twentieth century and include domestic, agricultural, military and industrial sites, and historic cemeteries.

Prior to a post-wide survey conducted by R. Christopher Goodwin and Associates, Inc. (Goodwin) in 1995, several small project-driven surveys were completed on the post. From 1993 through 1995, Goodwin conducted archaeological surveys on FGGM. The 1995 Phase I survey of approximately 2,210 acres resulted in identification of sites ranging in date from the prehistoric Archaic Period to the historic eighteenth through early twentieth century. A final Phase I Survey was conducted by URS in 2003 on portions of the property occupied by the National Security Agency (NSA).

From 2002 to 2004, URS conducted Phase II evaluations of previously identified sites on FGGM. The Phase II archaeological evaluation of 21 sites was conducted to determine whether each site was eligible for listing on the National Register of Historic Places (NRHP) and/or the Maryland Register of Historic Properties. To be eligible for the NRHP, the resources were required to meet one of four significance criteria. The Phase II sites included five historic, three multi-component, and 13 prehistoric sites. Prehistoric sites ranged in date from the Early Archaic through the Late Woodland Periods. Historic sites dated to the mid-eighteenth through early twentieth century; they included domestic, military, and post office sites. As a result of the Phase II evaluation, one prehistoric site (18AN1240) was determined eligible for inclusion in the NRHP and recommended for preservation or Phase III data recovery.

All buildings on FGGM built before 1960 were surveyed and evaluated for the NRHP. The FGGM Historic District, Building 8688, and the water treatment plant are determined eligible for the NRHP. One additional building constructed in 1954 was identified that may be eligible.

3.12.1 Site A

Site 18AN989 may be partially within Site A, or just outside of the western boundary. The site was identified by Goodwin in 1995, and evaluated by URS Corporation in December of 2002 (URS, 2003). Site 18AN989 appears to have been a camp site occupied repeatedly from the Middle Archaic through the Late Woodland Periods. The site's location overlooking the confluence of Midway Branch and a tributary would have been attractive to prehistoric inhabitants of the region. Most of the artifacts were recovered from disturbed plowzone contexts and therefore have limited research value. In addition, the compressed stratigraphy at the site limits the value of the Woodland components at the site. The Late Archaic component appears to be ephemeral, and not of significant research value. No features were identified during the Phase II study, further limiting the importance of this site. Ste 18AN989 was determined to have no potential to yield significant information regarding prehistoric lifeways in the Maryland Coastal Plain, and was determined ineligible for inclusion in the NRHP. No further archaeological investigation is required.

3.12.2 Site C

Site 18AN988 is within Site C. Site 18AN988 was identified by Goodwin in 1998. URS conducted a Phase II evaluation of the site in January of 2003 (URS, 2003). The site is the remains of the residence built by James A. Bruce after 1850; the residence changed hands between Jeremiah Blanche, Henry D. Farnandis, and T.H. Morgan in the late nineteenth century. The site appears to have been abandoned in the early twentieth century, probably following acquisition of the property by the Army. Site 18AN988 is extensively disturbed as a result of subsequent activities, including construction and demolition of barracks and supporting facilities

(e.g., roads, water and sewer pipes). No vertical or horizontal artifact patterning is present. The site is not eligible for inclusion in the NRHP, and no further archaeological investigation is required.

3.12.3 Site L

Site 18AN972 (The Friedhofer & Gary Cemetery) is located within Site L. This historic cemetery was identified by Goodwin in 1995. It contains 25 deceased persons in a fenced area that is approximately 40 feet by 40 feet (see Figure 3-4 and Appendix A.1, Photograph NR-L5).

3.12.4 Site S

Information on previously identified archaeological sites within this area is not available. It is known, however, that no sites requiring additional investigation are present within this area. The Phelps cemetery is located on Site S (Figure 3-5) and contains five headstones (Appendix A.1, Photographs NR-S1 and NR-S2). It is located in the southeastern portion of the site.

There are no historic above ground resources present on Site S. The Library of Congress (LOC) has historic warehouses within ¼ mile northwest of the site that have not been evaluated. There are several historic districts within ½ mile of Site S. The Odenton Survey area is adjacent to the eastern boundary. The FGGM base historic district is north of Site S.

4.1 GENERAL SITE HISTORY

FGGM has been an active military facility since 1917. The installation is located in Anne Arundel County along the Baltimore, Maryland-Washington D.C. corridor (Highway 295) and is approximately equidistant from both cities.

Camp Annapolis Junction was established in 1917 on a tract of land between Odenton and Annapolis Junction. In May 1917, Congress passed a bill authorizing the construction of 16 cantonments for training troops for World War I. On 23 June 1917, a general contract was signed by the government to lease the land from George Bishop, president of WB&A Electric Railroad Company. Prior to its transfer to the government, the land was used for farming (Figure 4-1) (USACE, 2004).

Construction on the cantonment began on 2 July 1917, and the area was named "Camp Meade" after Major General George G. Meade of the Civil War. The first troops arrived at Camp Meade on 15 September 1917. During World War I, over 100,000 men and women were trained at Camp Meade. When the war ended in November 1918, Camp Meade was used as a demobilization center for over 96,000 troops returning from Europe. During this time the government determined that the land (over 7,500 acres) should be purchased and they began the process. In 1919, the Tank Corps was formed and located at Camp Meade. In addition, summer training camps were held at Camp Meade to provide military training for civilian personnel.

In 1928, Camp Meade was made a permanent installation and renamed Fort Leonard Wood. The name was changed in 1929 to Fort George G. Meade (USACE, 2004).

In 1941, FGGM was expanded in preparation for World War II. FGGM acquired an additional 6,137.87 acres, increasing the size of the installation to over 13,800 acres. The 29th Division consisting of National Guard units was activated and assigned to FGGM (USACE, 2004). During World War II, FGGM's primary mission was troop training and it is estimated that nearly 3.5 million people passed through the facility. FGGM also served as the Prisoner of War Information Bureau and housed some prisoners of war from Germany and Italy. FGGM continued its mission to supply troops until 1945, when operations were changed and FGGM became a separation center for processing troops eligible for discharge. This operation continued into 1946 (USACE, 2004).

Expansion of FGGM during and after World War II transformed the surrounding area with the establishment of large residential and business districts. In 1994, as a result of a BRAC round, approximately 1/2 of FGGM (the most southwestern portion) was given to the Department of the Interior for the development of a wildlife refuge. Today, FGGM provides support and services for more than 50 tenant units which include the Defense Information School, Headquarters, the U.S. Army Field Band, the NSA, and the U.S EPA Environmental Science Center Library.

4.2 CURRENT AND PAST SITE USES

This section presents an overview of current and historical operations at Sites A, C, L, and S and provides a description of the installation facilities. Historic land uses of Sites A, C, L, and S and the rest of FGGM have been researched and documented by various organizations conducting investigations of FGGM. This information has been assembled and added to information

collected through EBS record searches, interviews, aerial photographs, and map reviews. This section also contains a general description of structures previously located at the site and removed as described through existing documentation or site visits.

4.2.1 Site A

Site A is mostly occupied by soccer and baseball fields and parking areas. The wooded Franklin Branch stream valley extends along the entire western border of the site. A recreational vehicle storage yard (RV park) occupies the southern end of the site. The site is classified in the Administrative Zone (RK&K, 2004) (Figure 4-2).

The U.S. Government purchased the property in 1919 for the construction of the military base. A period plate map showing the landholdings for the military base identify J. John Freidhofer as the owner of the property at the time of acquisition by the government (Figure 4-1) (Office of the Quartermaster General, 1919).

The area that makes up Site A was not developed for many years. A 1938 map (FGGM, 1938) shows an unimproved road identified as Inf. Trail 66th trending north-south through the center of the site and another unimproved road identified as Inf. Trail trending east-west in the northern 1/3 of the site (Figure 4-3). Most of the area appears open in 1938. A small clump of woods is noted in the southwest portion of the site and orchards are noted just to the east of the site.

No development is seen in the 1943 (EDR, 2005d) or 1947 (EDR, 2005d) aerials but in a 1949 aerial (EPA, 1996), a small structure is observed on the eastern edge of the site. In 1957 (EDR, 2005d), several cleared roads or pathways are shown throughout the site and several baseball fields are portrayed in the south-central portion.

The only change in 1963 (EDR, 2005d) is the inclusion of an oval-shaped track in the northwest quadrant of the site and a building in the southeast corner of the site. By 1970 (EDR, 2005a), three medium-size structures have been added along the southern edge of the site. By 1980 (EDR, 2005d), the oval-shaped track on the northern portion of the site is no longer portrayed, but what was identified as a materials storage yard is shown on the southern portion of the site (EPA, 1996). This area is currently an RV park. This RV park is the only improvement seen in a 1995 aerial photograph (EPA, 1996). Currently, the RV park is still present but the only structure on Site A is Building 2724, located in the southeastern portion of the site. Building 2724 had various uses in the past (Versar, 2001a), including the preparation of military vehicles for shipment and a vehicle and equipment repair and maintenance shop. It was given to Youth Services (Pane, pers. comm.) which presently uses it for storage of sports-related equipment. The old oil-changing pits can still be seen in the floor of this building. Currently, the remainder of this site is used as ball parks and recreation areas.

4.2.2 Site C

Site C is mostly disturbed land, currently with a cluster of wood-framed barracks and offices in the west-central quadrant of the site and an open field with remnant asphalt surfaces in the east-central quadrant (Figure 4-4). The southern ¼ of the site is a wooded area that is bisected by Chisholm Avenue. Site C is classified in the Administrative Zone (RK&K, 2004) (Figure 4-2).

The U.S. Government purchased the property that makes up Site C in May of 1919 for the construction of the military base. Period plate maps showing the landholdings for the military base identify J.S. Clark, Jr. as the owner of the property at the time of acquisition by the government (Office of the Quartermaster General, 1919).

In 1938 (FGGM, 4-3) the site is approximately half open field and half woodland with several unimproved roads trending southeast, east, and south throughout the site (Figure 4-3). One of the roads is labeled "Inf. Trail."

By 1943 (EPA, 1996), numerous small structures and three small roadways had been constructed on the site. These small structures were most likely barracks, although a church was present in the southwest portion of the site. The structures and associated roadways are situated amid several small wooded areas. Most buildings were located in the central portion of Site C. An undated map of the base showing all the buildings present on Site C also shows a Motor Pool southeast of Site C, south of 18th Street and a Motor Pool northeast of Site C, north of 20th Street.

No changes to the number of structures or roadways were seen at the site up to 1980 (EDR, 2005e) when many of the structures in the northeast quadrant of the site had been cleared. By 1988 (EDR, 2005e), all of the structures in the northeast quadrant of the site have been cleared. All that remains in this portion of Site C are footer stones from the barracks and several fire hydrants (URS, 2003). Currently, structures remain only on the northwest quadrant of Site C.

4.2.3 Site L

The eastern half of Site L is a disturbed area with many remnant asphalt surfaces and a lined drainage channel that runs north to south. The northeastern portion of the site is mostly wooded with abandoned asphalt roads and is distinguished by a topographic high that is known as Division Hill. According to a historical marker erected at the site, Division Hill housed the Headquarters for the 29th Infantry and 76th Infantry Divisions and the Army Ground Forces Replacement Depot No.1 during World War II. Site S is divided into two land use categories: Administrative and Green zones (RK&K, 2004) (Figure 4-2).

A small arms range known as Pistol Range A occupied a 4-acre parcel that extends into the northeastern corner of Site L. The range was reportedly used from approximately 1924 until the early 1940s. It appears only small arms were used on the range but no conclusive information is available (Malcolm Pirnie, 2003).

The southern two-thirds of the area that makes up Site L was purchased from John Freidhofer in 1919 and the northern one-third was purchased from John Weber (Office of the Quartermaster General, 1919). The land was not developed for many years. A small cemetery, later identified as the Friedhofer Cemetery, is depicted on the 1919 map (Figure 4-1).

On a 1938 map (FGGM, 4-3), Site L is mostly clear with one clump of trees in the center of the site. Division Hill is identified as "Vesle Hill" at this time (Figure 4-3). Two groups of orchards are shown in 1938, one in the west-central portion of the site and the other in the southern portion of the site. The 1938 map shows three unimproved roads in the northern portion of the site (Figure 4-3). Two of the roads have no name and they trend northwest-southeast and northeast-southwest. The third road is identified as "Inf. Trail" and it trends

east-west. Two of the unimproved roads merge to form a fourth road trending north-south located in the southern portion of the site.

By 1943 numerous small structures, associated roadways, and three medium-size buildings had been erected on the site (EPA, 1996). These were reportedly barracks in support of the war effort (Ginter, pers. comm.). By 1947, a drive-in theater is present in the west-central portion of the site, south of the Friedhofer Cemetery (EPA, 1996). The headquarters on top of Division Hill is also present by 1947. An undated map of the base showing all the buildings present on Site L also shows a Motor Pool east of the northeast corner of the site.

No changes to the site were noted until 1970 (EDR, 2005d) when a medium-size building is depicted near the southwest portion of the site. No changes were again noted until 1995 (EPA, 1996) when the structures on the northern and southern end of the site are gone. Currently no structures are present at the site; the only improvements are roadways and infrastructure (underground and aboveground utilities).

4.2.4 Site S

Site S occupies about 349 acres in the southeast corner of FGGM, south of Maryland Route 32. Residential and light-industrial areas are located east and north of the site. Neighboring properties include the National Railroad Passenger Corporation (Amtrak) maintenance yard, a residential trailer park, residences, and commercial business facilities. The Patuxent Wildlife Research Center occupies the land to the west. A majority of Site S is designated as Forest Conservation Area.

The area that makes up Site S was not developed for many years after purchase by the government. Prior to purchase by the government, the area was wooded. Early use of Site S was as a training/maneuver area for exercises with armored cavalry units, possibly from World War I through the 1930s. By 1922 a machine gun range is noted in the southwest portion of the site (Figure 4-5) (Army Map Services, 1922).

Some of the place names noted at Site S in 1938 included Argonne Woods, Gievres Hill, Humphreys Ridge, Forrest Hill, Odenton Ridge, and San Juan Hill (Figure 4-6). Site S, in 1938, was mostly wooded with a few unimproved trails (Forrest Hill Road, Odenton Trail, Range Road). Odenton Creek and its tributaries drain the site. These tributaries run through the northern and central portion of the site.

Subsequent FGGM training missions added other facilities and the establishment of discrete training areas south of the Baltimore and Ohio Railroad right of way. Several firing ranges were established along the south side of Range Road. In support of these activities, by 1943 (EPA, 1996) 12 concrete structures, designated Ammunition Supply Points (ASP), had been constructed in the central portion of the site along with some roads encircling the bunkers. Access was established along a route that is now Magazine Road. Electrical service was apparently in place until the structures were demolished in the mid 1990s. Much of the ASP was converted to wetlands as part of the landfill mitigation program. Old aerial photographs show at least two buildings in a cleared area on Magazine Road a short distance west of the ASPs. Concrete foundations remain in this staging yard located just inside the landfill access gate. These buildings predate the landfill and may have been related to the ammunition storage activity.

Numerous trails, roadways, and a few additional structures show up at various times. By 1957, several small patches of cleared land appear in the northeast corner of the site, possibly as part of the training grounds described in the next paragraph.

Three formally defined training areas were established on the southeastern part of FGGM. Area A was northwest of Site S, was approximately 18 acres in size, and is located south of Route 32, west of the present archery range, and north of the present Range Control facility. Training Area A is assumed to have been in operation from the late 1950s until the BRAC in 1988. Training Area B is identified in FGGM maps from the 1950s to 1980s as land south of Route 32 and residential property, west of the present Amtrak right of way, and adjacent to the ammunition storage area. The initial construction date is unknown, but it is assumed the area was utilized for training from the 1950s until the BRAC. Portions of Area B were incorporated into the sanitary landfill. Area C encompassed the generally wooded area north of Range Road and south of the Ammunition Supply Point. The present orienteering area and the obstacle course are part of the Area C site. There is no documented weapons use at any of these training areas.

The sanitary landfill began operations in 1958 over a large portion of the Area B training area. The landfill utilized the trench method of disposal until the fall of 1976. At that time the land was consumed with regard to the trench method of filling. Recognizing the limits of the sanitary landfill site, a study was prepared to evaluate the options open to FGGM for future solid waste management. Based on the recommendations of that study, sanitary landfilling continued at the same site, altering the operation to the area fill method. This change extended the projected life of the sanitary landfill site by an estimated 18 years from the point of conversion. The landfill was constructed as an unlined facility and was managed as two cells. While functioning, this facility was designated the Active Sanitary Landfill (ASL). The landfill was used for the disposal of "mixed residential, commercial, and non-hazardous industrial wastes."

By 1970, a large patch of land, most likely one of the two existing landfill cells, was cleared in the northeast quadrant of the site and many trees were removed, possibly in preparation for the next landfill cell, east and southeast of the site.

In March of 1994, a federal/state mandated monitoring program was initiated to identify potential deficiencies in the landfill operation. The landfill ceased operations in 1996 and the final cell was capped in 1998. Using a flexible membrane liner, Cell 1 was capped and closed during the period from 1995 through 1997 and Cell 2 was capped and closed during the period from 1997 through 1999.

The right-of-way for the old Baltimore & Ohio Railroad bed divides the section in half longitudinally. Several buildings occupy Site S including storage buildings and offices (Figure 4-7).

A number of facilities continue in use at this site. Several buildings along Range Road provide offices and storage for range supplies. The forested area along Range Road continues as an active training area with an obstacle course, an orienteering range, and offsite is a fire department training area. A live ammunition range is located adjacent to the property on the southwest side of Range Road. An archery range is located in the northwestern portion of Site S. The northwestern corner of Site S serves as a staging and storage area for bulk materials. An easement for a regional electrical transmission line runs east-west just to the north of landfill cells 2 and 3. Site S land uses are shown in Figure 4-8.

4.3 DOCUMENTS REVIEWED

4.3.1 Site A

Versar, Inc. December 7, 2001. Site Investigation Report, Building 2724 (SWMUs 80 through 86), Fort George G. Meade, Ft. Meade, Maryland.

In September 2001, Versar, Inc. prepared a Site Investigation Report for Building 2724, Solid Waste Management Units (SWMUs) 80 through 86, located in the southeast corner of Site A. The report summarized an initial site investigation conducted by CH2M HILL, as well as further investigation conducted by Versar. The purpose of the study was to further evaluate the soil and groundwater quality associated with Building 2724 and wash racks and oil/water separators located west of Building 2724. Direct-push soil and groundwater samples were collected and analyzed for diesel- and gasoline-range Total Petroleum Hydrocarbons (TPH), Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), metals, herbicides and pesticides. The lab results were compared to EPA Region III Risk-Based Concentrations (RBCs) and MDE cleanup standards, as well as background ranges for the FGGM area and anticipated typical concentrations for eastern Maryland.

The soil borings revealed the presence of diesel-range TPH, one VOC (methylene chloride), and seven total metals (arsenic, barium, cadmium, chromium, lead, mercury, and selenium). Of all the contaminants found, only arsenic was determined to be at concentrations above both residential standards but below the industrial and non-residential standards. However, according to Versar, the arsenic concentrations in the soil samples were within the expected background range for the FGGM area. Visual and olfactory evidence of soil contamination, as well as elevated PID readings were not observed during the site investigation.

Groundwater samples were found to have the presence of diesel-range TPH, 11 VOCs (methylene chloride, acetone, carbon disulfide, chloroform, 2-butanone, carbon tetrachloride, bromodichloromethane, dibromochloromethane, benzene, toluene, and methyle tertbutyl ether), one herbicide (MCPA), 19 total metals, and 14 dissolved metals. Many of contaminants were above the RBCs for tap water and the MDE cleanup standards for Type I and II aquifers.

Versar did not draw conclusions or make any recommendations in their report. However, since many of the contaminants detected in the groundwater samples were above standards, further work at this site may be required.

Versar, Inc. December 14, 2001. Site Investigation Report, Wash Racks at Building 2728 (SWMUs 87, 88, 89, 90, 91, and 92), Fort George G. Meade, Fort Meade, Maryland.

In December 2001, Versar, Inc. prepared a Site Investigation Report for the wash racks at Building 2728 which were located in the southwest portion of Site A. Building 2728 is no longer there. The report summarized an initial site investigation conducted by CH2M HILL, as well as further investigation conducted by Versar. The purpose of the study was to further evaluate the soil and groundwater quality in the immediate vicinity of Building 2728. Direct-push soil and groundwater samples were collected and analyzed for diesel- and gasoline-range TPH, VOCs, SVOCs, metals, herbicides, and pesticides. The lab results were compared to RBCs and MDE cleanup standards.

The soil borings revealed the presence of diesel-range TPH, one VOC (methylene chloride), three herbicides, three pesticides, and eight metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). The following compounds were detected above a standard:

- Arsenic was detected at a concentration above the RBC for residential use but below the RBC for industrial use.
- Methylene chloride and mercury were detected in soil at concentrations above the MDE cleanup standard for groundwater protection but below MDE standards for residential and nonresidential use scenarios.
- According to Versar, the metals concentrations in the soil samples were within the expected range for the FGGM area.

Visual and olfactory evidence of soil contamination, as well as elevated PID readings were not observed during the site investigation.

Diesel-range TPH, eight VOCs (methylene chloride, acetone, carbon disulfide, chloroform, 2-butanone, bromodichloromethane, benzene, toluene), methyle tertbutyl ether, and five total metals (barium, cadmium, chromium, lead, and mercury) were detected in groundwater samples. The following compounds were detected above a standard:

- Bromodichloromethane and chloroform were detected above the RBCs for tap water.
- Diesel-range TPHs were detected above the MDE cleanup standards for Tier I and II aquifers.

Versar did not draw any conclusions or make any recommendations in their report. However, since some compounds were detected above action levels, further work may be required at this site.

4.3.2 Site C

The following report is adjacent to Site C and, therefore, would have the potential to impact Site C.

Versar, Inc. September 2000. Draft Initial Delineation Reports, Equipment/Vehicle Storage Yard Wash Rack System (Bldg. 1007), 20th Street, Fort George G. Meade, Fort Meade, Maryland.

In September 2000, Versar, Inc. prepared an Initial Delineation Report for the Equipment/Vehicle Storage Yard Wash Rack System (Building 1007) located northeast of the northeast corner of Site C. The purpose of the report was to evaluate the environmental impact from past use of the site which included washing military equipment and vehicles. Versar collected direct-push soil and groundwater samples for laboratory analysis, as well as conducted a sensitive receptor survey (SRS).

Fifteen total soil samples were collected at the site. Stained soils were not observed at the time of the site investigation but petroleum odors were noted at four of the sampling locations. Soil borings were analyzed for VOCs, SVOCs, Metals, and TPH. The following statements were made regarding samples exceeding an action level:

- The report states TPH was not detected in any of the samples at concentrations above MDE cleanup standards; however, a statement regarding comparison to RBCs was not made.
- The report states that VOCs and SVOCs were not detected at concentrations above their RBCs for industrial and residential soil; however, a statement regarding comparison to MDE cleanup standards was not made.
- The report states that arsenic was detected at concentrations above its RBC for industrial and residential soil in six samples; however, a statement regarding comparison to MDE cleanup standards was not made. According to Versar, the arsenic concentrations in these six samples were within the expected background range for the FGGM area.

Four groundwater samples were collected at the site. Visual and olfactory evidence of groundwater contamination was not observed. All samples were analyzed for VOCs and gasoline-range TPH but only one sample was analyzed for metals. The following statements were made regarding samples exceeding an action level:

- Gasoline-range TPH exceeded MDE standards in one of the samples; however, a statement regarding comparison to RBCs was not made.
- Five VOCs (benzene, 1,1,2,2 tetrachloroethane, 1,2,4 trimethylbenzene, naphthalene, and tetrachloroethene) were detected in groundwater samples at concentrations above their RBCs for tap water; however, a statement regarding comparison to MDE cleanup standards was not made.

One sample had detected total lead level in groundwater samples at a concentration above its *de facto* RBC for tap water; however, a statement regarding comparison to MDE cleanup standards was not made. Because the concentration of dissolved metals is less, the report indicates the elevated lead level is most likely due to the presence of suspended solids.

Versar concluded that although gasoline range TPH and VOCs were detected in groundwater samples at elevated levels, there are no complete pathways to exposure to potential human receptors. Versar recommended that groundwater monitoring wells be installed to better assess the risk and to determine remediation methods.

4.3.3 Site L

Versar, Inc. June 7, 2000. Sampling Visit, Solid Waste Management Units 96 and 97, Building 2831, Fort George G. Meade, Fort Meade, Maryland.

In February 2000, Versar, Inc. conducted sampling activities for SWMUs 96 and 97 at Building 2831 which was located in the south-central portion of Site L, in the northeast corner of the intersection of 14th Street and Ernie Pyle Street (the building is no longer there). Building 2831 held x-ray processing units (SWMU 96) and a laboratory where chemicals were used and stored (SWMU 97).

Soil borings were advanced and six soil samples were collected. The samples were analyzed for VOCs, SVOCs, metals, and gasoline- and diesel-range TPHs. Four metals (arsenic, barium, chromium, and selenium) were detected. Only arsenic exceeded its RBC for residential and industrial soil. Arsenic was also detected above its expected regional background level

Based on the sampling results and past uses of Building 2831, Versar recommended that further investigations and/or remedial activities be conducted.

4.3.4 Site S

U.S. Army Center for Health Promotion and Preventive Medicine. 23 March – 30 June 1994. Groundwater Consultation No. 38-26-K33W-94, Initiation of Detection Monitoring Program, Fort George G. Meade, Maryland.

The purpose of the consultation was to initiate the groundwater detection monitoring program and surface water quality monitoring for the active municipal solid waste landfill (MSWLF).

After samples were collected and analyzed, the U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) found that the upper groundwater had been contaminated by at least 14 VOCs; benzene and vinyl chloride were detected above maximum contaminant levels (MCLs). Furthermore, the upper groundwater contained statistically higher concentrations of 11 different metals downgradient of the landfill. The USACHPPM concluded that landfill leachate had impacted seven upper groundwater monitoring wells (MW-2S, MW-10S, MW-12S, MW-13S, MW-14, MW-17, and MW-19) along the southern and eastern edge of the landfill (Figure 4-9).

Analytical results indicated that the MSWLF had not impacted the groundwater quality of the lower groundwater. Upgradient well MW-4D may have a low level of VOC contamination. It also had anomalous water quality levels. Because of this and its upgradient location, the USACHPPM recommended that well MW-4D be removed from the lower groundwater monitoring program.

Surface water samples did not identify VOC contamination from landfill leachate. However, metal and inorganic results suggest that landfill leachate may be affecting the quality of surface water that flows offsite.

Other than the recommendation for MW-4D, USACHPPM made no other recommendations. However, based on the chemical analytical results, further action should be taken regarding the upper groundwater and surface water contamination.

Arthur D. Little, Inc. March 1999. Active Sanitary Landfill Atrazine Study. Fort Meade Feasibility Study and Remedial Investigation/Site Inspection, Fort George G. Meade, Maryland.

In the fall of 1994, Arthur D. Little Inc. conducted groundwater sampling of private drinking water wells located near the ASL. The herbicide, atrazine, was detected in one of the wells above its Maximum Contaminant Level (MCL). Because the private drinking water wells are in proximity to the ASL, the U.S. Army Environmental Center (USAEC), in April 1995 contracted to collect groundwater, surface water, sediment, and soil samples from the ASL. The samples were analyzed for atrazine to determine if the ASL was the source area.

Atrazine was not detected in any of the groundwater, surface water, sediment, or soil samples. The soil samples were also analyzed for Target Analyte List (TAL) metals. Arsenic was detected at concentrations above its residential RBC but below its industrial RBC. The detection limit for thallium was above its residential and industrial RBC and the detection limit for beryllium was above its residential and below its industrial RBC.

No conclusions were drawn or recommendations made in this report, however, it seems that no samples were detected above its respective industrial RBC.

Arthur D. Little, Inc. March 1999. Off-Post Drilling and Sampling Results and Surface Water Sampling Results, Fort Meade Feasibility Study and Remedial Investigation/Site Inspection, Fort George G. Meade, Maryland.

Arthur D. Little, Inc. prepared this Remedial Investigation Report in conjunction with their above-summarized Atrazine Study. The purpose of this project was to conduct off-post drilling in order to obtain additional soil and groundwater quality data off-post and down-gradient from the ASL. In addition, surface water samples were collected to compare with previous sampling results.

Atrazine was not detected in either surface water nor soil samples. Also, soil samples were tested for TAL metals. Only one metal, arsenic, was detected at levels above the residential and/or industrial RBCs for carcinogenic arsenic.

Groundwater samples were analyzed for atrazine, TAL metals, VOCs, SVOCs, chloride, sulfate, nitrates, and TDS. Atrazine was only detected in one shallow off-post monitoring well at a level below its MCL but above its tap water RBC. Tetrachloroethylene (PCE) and trichloroethylene (TCE) were detected in the deep offsite well at levels above their RBCs but below their MCLs. Chloroform was detected in one shallow offsite well at a level below its MCL but above its tap water RBC.

No conclusions were drawn or recommendations made in this report, however, it seems that shallow and deep offsite wells may be affected by different contaminants.

Malcolm Pirnie, Inc. March 1999. Fort George G. Meade, Maryland Offpost and Sanitary Landfill Study, Final Groundwater Database Report.

At the time that this report was being prepared, Site S was an ASL that was unlined and divided into two cells. The site was undergoing closure under the MDE RCRA program. Numerous monitoring wells had been installed in the vicinity of the ASL, including offsite locations. Malcolm Pirnie, Inc. created a database that compiled sampling data and well information for the monitoring wells located in the ASL vicinity. Malcolm Pirnie reviewed previous sampling reports and incorporated the sampling analytical data into a database and report.

IT Corporation. July, 2001. Final Report of Results from May 2001 Sampling of Monitoring Well MW-4DR, Fort George Meade, Closed Sanitary Landfill.

On May 22, 2001, IT Corporation collected groundwater samples from monitoring well MW-4DR which is located north of landfill cell 2 on Site S. The purpose of the sampling was to confirm the presence of carbon tetrachloride and to provide additional groundwater data for the monitoring well. The samples were analyzed for VOCs, SVOCs, pesticides, herbicides, polychlorinated biphenols (PCBs), and metals. The sample results were compared to previous sampling events conducted at MW-4DR since January 1999. The levels of carbon tetrachloride in the May 2001 samples were found to be comparable to the levels found in previous samples. Carbon tetrachloride and thallium were the only analytes that were detected above MCLs. However, since thallium was also detected at high levels in an associated blank sample, IT Corp reported that it should be considered non-detect. Levels of all analytes were reportedly comparable to levels detected in previous sampling of this well.

IT Corporation. November 2001. Groundwater Remedial Investigation, Work Plan Addendum, Fort George Meade Closed Sanitary Landfill.

IT Corporation was contracted to perform a Groundwater Remedial Investigation at the Closed Sanitary Landfill (CSLF). From 1995 through 1998, the CSLF was closed under RCRA. In order to ensure that leachate from the landfill did not impact the groundwater, a groundwater monitoring program for the Upper and Lower Patapsco Aquifers was initiated. Groundwater samples that were collected in December 2000 showed elevated concentrations of some constituents. In addition, two VOCs, total PCBs, and three metals were detected at levels above MCLs. This Addendum was divided into eight sections: Introduction, Site Description and History, Overview of Groundwater at the CSLF, Planned Field Activities and Technical Approach, Field Procedures, Analytical Requirements and Data Quality Objectives, Reporting, and References.

EM Federal Corporation. July 2003. Closed Sanitary Landfill Groundwater Data Report, Fort Meade, MD. Draft Document.

In 2003, EM Federal Corporation conducted a groundwater investigation at the CSLF on Site S. The investigation included the following two phases:

- A shallow groundwater investigation utilizing direct push groundwater screening samples and shallow well samples analyzed for VOCs to assess the water quality of the Upper Patapsco aquifer and to eliminate the shallow aquifer as a potential source of carbon tetrachloride contamination for monitoring well MW-4DR;
- Installation and sampling of deep wells. Fourteen new deep wells were installed to assess the groundwater quality of the Lower Patapsco aquifer and the area surrounding MW-4DR. Samples were analyzed for VOCs, SVOCs, metals, pesticides, herbicides, and PCBs.

The results of the shallow groundwater (Upper Patapsco Aquifer) screening are as follows:

- Groundwater Screening Results from Samples Collected North of the CSLF:
    - Carbon tetrachloride was not detected in the aquifer in this area, therefore, shallow groundwater was not the source of carbon tetrachloride detected in monitor well MW-4DR.
    - Shallow groundwater in this area does not appear to be significantly impacted by VOCs which might be related to the CSLF.
- Groundwater Screening Results from Samples Collected South and East of Cell 1:
    - Benzene was detected above the MCL near the southernmost tip of cell 1 and above Tap Water RBCs in 9 out of the 10 sampling points.
    - Several different VOCs were detected sporadically above Tap Water RBCs; however, carbon tetrachloride was not detected in the shallow groundwater samples.
    - The highest VOC levels were detected just southeast of the south tip of Cell 1
    - Shallow groundwater flows south-southeast from Cell 1 and is transporting VOCs and benzene across the site boundary towards the Amtrak Maintenance Yard; however, the offsite topography is about at the same elevation as onsite making it unlikely that groundwater contamination has migrated a significant distance.
- Groundwater Sampling for VOCs From Shallow Wells Located South of the CSLF:

  - In the five shallow wells sampled, no VOCs were detected above the MCLs.
  - Benzene and chloroform were detected at levels above the Tap Water RBCs.

The results of the deep groundwater (Lower Patapsco Aquifer) sampling are as follows:

- Carbon Tetrachloride Investigation Results From Wells Located North of the CSLF:
  - The source of carbon tetrachloride in MW-4DR is on-post and most likely west of Site S and the CSLF.
  - Carbon tetrachloride is above MCL levels at MW-115D (located southeast of MW-4DR) and is migrating in an off-post direction.
  - The source of carbon tetrachloride is probably on-post and is migrating east-southeasterly just north and east of Cell 2.
  - Carbon tetrachloride in the Lower Patapsco Aquifer does not appear to be related to the CSLF.
- Deep Groundwater Investigation Results From Wells Located Downgradient of the CSLF:
  - Five wells were installed offsite, southeast of Cell 2, between the Amtrak Maintenance Yard and Maryland Route 175.
  - No analytes were detected above MCLs. A few compounds were detected at concentrations above Tap Water RBCs.

Malcolm Pirnie, Inc. November 2003. US Army Closed, Transferring, and Transferred Range/Site Inventory for Fort George G. Meade, MD.

The U.S. Army contracted with Malcolm Pirnie, Inc. to compile an inventory of Closed, Transferring, and Transferred (CTT) ranges and other CTT cites with unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC) as the third phase of their range inventory. The report identified six closed ranges (two former pistol ranges, a former grenade and bayonet range, a former mortar range, and two training areas) totaling 281 acres throughout FGGM. An assessment was also performed of explosives safety risk for each range and site with UXO and DMM. Based on the results, each range was given the following score for relative explosives safety risk ranging from 1 (high explosives safety risk) to 5 (negligible explosives safety risk):

- Grenade & Bayonet Range (in western portion of base) = 2 (munitions types: hand grenades)
- Mortar Range (in western portion of base) = 1 (munitions types: mortars)
- Pistol Range A (extends over a portion of the northern corner of Site L) = 5 (munitions types: small arms)
- Pistol Range B (in western portion of base) = 5 (munitions types: small arms)
- Training Area A (located adjacent to and northwest of Site S) = N/A (munitions types: none)
- Training Area B (the northwest portion of Site S) = N/A (munitions types: none)

EM Federal Corporation. December 2003. Fort George G. Meade, Closed Sanitary Landfill, Site Specific Addendum to the Generic Field Sampling Plan. Draft Final Document.

From 1995 through 1998, the CSLF was closed under RCRA. In order to ensure that leachate from the landfill did not impact the groundwater, a groundwater monitoring program for the

Upper and Lower Patapsco Aquifers was initiated. Groundwater samples, which were collected semi-annually, showed elevated concentrations of constituents. In addition, two VOCs, PCBs, and three metals were detected at levels above MCLs. Carbon tetrachloride was detected in MW-4DR, which is upgradient from the CSFL. As a result, the MDE requested that the Army characterize the nature and extent of contamination at the site. In this report, EM Federal Corporation drafted a Work Plan Addendum for the Army for sampling activities at the closed landfill. The Addendum was broken into six sections: Introduction, Overview of Groundwater at the CSLF, Planned Field Activities, Technical Approach for Sampling Activities, Sample Management and Analysis, and References.

USACE, 2004. 2004 Annual Report for the Fort Meade Solid Waste Landfill Groundwater and Surface Water Detection and Assessment Monitoring. December 2004.

Several environmental investigations have addressed the possibility of contamination related to chemicals leaching from the closed landfill.

In 1994 concerns for the quality of domestic water produced from wells at residences along Old Waugh Chapel Road east of Site S led to an investigation of atrazine, an herbicide commonly applied along roads and railroads to control weeds. Groundwater from the upper and the lower Patapsco aquifers, surface water, stream sediment, and soil samples were tested as non-detect for this compound.

Detections of chloroform and carbon tetrachloride in the lower Patapsco groundwater sampled from the upgradient well, MW-4DR resulted in additional sampling and the conclusion that these constituents probably do not originate from the landfill.

The termination of disposal activity in the mid-1990s included installation of a landfill cover incorporating an impenetrable membrane as part of the cap. Closure of the landfill under RCRA included the initiation of long-term groundwater monitoring. A constellation of groundwater monitoring wells around the landfill provides water sampling points and access to measure the potentiometric surfaces of the two Patapsco aquifers. Groundwater flow directions are interpreted from the gradients observed on the potentiometric contour maps. Sampling to determine background conditions for groundwater began in March 1994. During the initial or detection monitoring phase, which includes 81 chemical and physical parameters, several organic and inorganic constituents were detected at concentrations significantly increased from background. These detections triggered the assessment monitoring phase which includes 231 parameters. Details of the groundwater monitoring program, the analytical program, and the results of the September 2004 sampling are included in the 2004 Annual Report of the landfill monitoring (USACE, 2004). The following table lists the chemicals detected in the September 2004 sampling that exceeded either of two screening criteria for water quality, the MCLs and the EPA Secondary Maximum Contaminant Levels (SMCL).

Ft. Meade Solid Waste Landfill Groundwater Results from September 2004 Monitoring

Analyte	Maximum Concentration	MCL	SMCL
Upper Patapsco Aquifer			
Benzene	13 ug/L	5 ug/L	
Bis(2-ethylhexyl)Phthalate	150 ug/L	6 ug/L	

Analyte	Maximum Concentration	MCL	SMCL
Arsenic	55.8 ug/L	10 ug/L	
Iron	217,000 ug/L		300 ug/L
Chloride (anion)	481 mg/L		250 mg/L
Lower Patapsco Aquifer			
Carbon Tetrachloride	13 ug/L	5 ug/L	
Tetrachloroethene	6.2 ug/L	5 ug/L	
Iron	3,560 ug/L		300 ug/L

MCL from "2004 Edition of Drinking Water Standards and Health Advisories"
SMCL "Secondary Maximum Contaminant Levels", USEPA Website
ug/L micrograms per liter
mg/L milligrams per liter

The following reports are specific to the approximately 100-acre site located upgradient and adjacent to Site S to the northwest. Therefore, any contamination on the adjacent property would be likely to affect Site S:

Rummel, Klepper & Kahl Consulting Engineers. 19 May 1994. Initial Phase I Report, Site Assessment of 100 Acre Site, LOC Campus Facility, Fort George G. Meade, Maryland.

Rummel, Klepper & Kahl Consulting Engineers (RK&K) conducted an Initial Phase I study for an approximately 100-acre site located northwest of Site S. The property was to be transferred from the Army to the Architect of the Capitol for a future LOC facility. The site assessment included evaluations of the property, natural environment, hazardous wastes, utilities, and transportation access.

During the site assessment, a backfilled gravel and borrow pit was observed near the southern edge of the property. The report recommended the pit backfill material be investigated if that portion of the site is to be included in the transfer. In addition, two wetland sites and a portion of the 100-year floodplain were located on the property.

The report indicated that environmental contamination had been documented at the Defense Reutilization and Marketing Office (DRMO), Transportation Motor Pool (TMP), and Underground Storage Tanks (USTs) associated with the warehouse buildings located on the subject property. They recommended that the DRMO and TMP be excluded from the transfer site and that a Phase II investigation be conducted on all remaining areas to be transferred.

Malcom Pirnie, Inc. March 2000, Final Work Plan, Quality Assurance Project Plan Part II and Health and Safety Plan Part III. November 2000, Revised Final Work Plan, Field Sampling Plan Part I. Remedial Investigation, Fort George G. Meade, Maryland.

In 2000, Malcolm Pirnie, Inc. prepared a Work Plan for performance of Remedial Investigation (RI) field activities on an approximately 100-acre site of land at the southern end of FGGM, located just north of Site S. The RI was being conducted for a property transfer from the US Army to the Architect of the Capitol for use by the LOC. The Work Plan was comprised of three

components: a Field Sampling Plan, a Quality Assurance Project Plan, and a Health and Safety Plan.

URS. February 2001. Final Summary Report, Source Area Delineation of Carbon Tetrachloride, DRMO Facility, Fort George Meade, MD.

In February 2001, URS prepared a report summarizing site investigation activities that were conducted at the DRMO facility northwest of Site S. The investigation was done in association with the delineation of a potential source area of carbon tetrachloride groundwater contamination. Groundwater samples were collected from 18 Geoprobe borings located in the vicinity of monitoring wells MW-5, MW-6, and MW-7, as well as the motor pool area located east of Remount Road. Groundwater samples were also taken from MW-5, MW-6 and MW-7 and submitted for VOC analysis.

The highest concentrations of carbon tetrachloride were detected in the Geoprobe boring adjacent to MW-7. In addition, PCE, as well as various petroleum-related compounds, were detected in some of the samples. The highest concentrations were found in the sample located just east of a former UST.

Malcolm Pirnie, Inc. March 2002. Remedial Investigation at the Library of Congress Site. Volume I of II. Final Draft. Fort George G. Meade, Maryland.

Malcolm Pirnie was contracted to conduct an RI at the LOC site located northwest of Site S just north of State Route 32. The objective of the RI was to characterize the nature and extent of potential chemical contamination on the site and evaluate the potential human and environmental health risks associated with any detected contamination. The report summarized the nature and extent of soil, sediment, groundwater, and surface water contamination and looked at fate and transport pathways for site contaminants. This work was done in accordance with the above-summarized Final Work Plan dated November 2000.

The following is a summary of the RI findings and conclusions:

- Soil Contamination
    - Acetone, methylene chloride, and numerous tentatively identified compounds (TICs) were infrequently detected in soil samples at levels lower than EPA risk screening criteria. Therefore, these contaminants were not considered to be a concern.
    - Polynuclear Aromatic Hydrocarbons (PAHs) and phthalates were detected in numerous soil samples. However, there was no pattern to the contaminants found indicating the possibility of multiple small sources (i.e., fuel spills).
    - Many pesticides were detected in the soil samples but at concentrations below EPA screening criteria.
    - Approximately 20 different metals were detected in the soil samples. The majority of metals concentrations decreased from surface to sub-surface depths.
- Sediment Contamination
    - Acetone was detected in several samples but at levels below RBCs.
    - Pesticides were detected in all the sediment samples at the RBC levels.
    - Numerous metals were detected in all of the sediment samples. However, only arsenic exceeded the residential RBC.
- Groundwater Contamination

  - Numerous SVOCs were detected onsite. However, only 2-methylnaphthalene and naphthalene were found to be at levels exceeding the RBC for tap water and the MDE Groundwater Cleanup Levels.
  - Benzene, ethylbenzene, and xylenes were detected at two sample locations near the former UST and the TMP. The concentration of benzene exceeded the RBC for tap water, but was below the MDE Groundwater Cleanup Levels.
  - PCE was detected in one sample south of the gravel fill area. The concentration exceeded the RBC for tap water, but was below the MDE Groundwater Cleanup Levels.
  - Two pesticides, chlordane and heptachlor epoxide, were detected in the groundwater at one location. Heptachlor epoxide exceeded the RBC for tap water.
  - Many dissolved metals were found throughout the site but in no specific lateral pattern thus indicating that these metals may be naturally occurring.
- Surface Water Contamination
  - No VOCs, SVOCs, PCBs, or pesticides were detected in the surface water.
  - Many metals were detected in all of the surface water samples.
- Major Transport Pathways
  - Migration of pesticides and metals adsorbed to soil/sediment by storm runoff into Rogue Harbor Branch and a drainage ditch that runs along Rock Avenue.
- Fate and Transport of Contaminants
  - PAHs and pesticides can migrate absorbed to soil particles.
  - SVOCs, metals, and pesticides can migrate absorbed to sediment particles.
  - Manganese and arsenic can migrate absorbed to suspended sediment.

4.4 SITE RECONNAISSANCE AND INTERVIEWS

The site descriptions in this section are based on visits to these sites and interviews conducted during March and April 2005. The photographs referenced in this section can be found in Appendix A.2

4.4.1 Site A

Site A primarily consists of undeveloped grassy areas with ball parks and a few trees (Photos A-1 and A-2). A building is situated in the southeastern edge of the site. The following observations were made during the reconnaissance of Site A:

- Baseball, soccer, and football fields are located throughout the site.
- An intermittent stream that runs east-west borders the site to the south.
- An RV park with a building (Building No. 2724) that is enclosed by a fence was observed in the southeastern portion of the site (Photo A-3). The following observations were made regarding this building and the RV park:
  - The building is located in the southeastern portion of the site and the RV park covers the southern edge of the site (Photo A-4).
  - Concrete drainage channels were observed in the southeastern (Photo A-5) and southwestern (Photo A-6) corners of the paved area encompassing the RV park

and Building 2724. These channels drain into the intermittent stream that borders the southern edge of this site.

- Several transformers were observed on the site:
  - Three pole-mounted transformers are located in the south-central edge of the site, just north of the stream (Photo A-7). No labels were observed on these transformers.
  - Two pad mounted transformers (one on each side of the football field) were observed in the west-central (Photo A-8) and central (Photo A-9) portions of the site. No labels were observed on either and no staining was observed around either transformer.

4.4.2 Site C

Currently, the eastern portion of Site C is undeveloped and is mostly grassland with a few trees. The southern, northern, and western borders of Site C are wooded, as is a small portion of the center of the site. The western portion of the site contains buildings. Site C currently contains eight buildings for the 80th Brigade Headquarters (Photo C-1). All of the buildings are similar with the same construction and layouts with the only difference being the number of floors (Photo C-2). All the buildings are heated by natural gas – each building has a mechanical room in the back that could only be accessed from the exterior and contains the gas heater and boiler (Photo C-3). A floor drain was observed in each of the mechanical rooms accessed. Buildings 949, 968, 978, 988, and 998 contained window air-conditioning units and Buildings 948, 979, 999 have central air conditioning. The following buildings were inspected and observations recorded:

- 4 one-story buildings
  - Building 948 (Photo C-4) contains one big conference-like room with a small storage area in the southern portion of the building. Bathrooms and small offices are also noted in this building.
  - Building 949 (Photo C-5) contains offices.
  - Building 979 (Photo C-6) contains open areas, offices, and large metal containers that were locked but reportedly contain radio and broadcasting equipment (Gamble, 2005).
  - Building 999 (Photo C-7) contains large work areas and offices.
- 4 two-story buildings
  - Building 968 (Photo C-8) contains offices and storage.
  - Building 978 (Photo C-9) contains offices, a library, and supplies storage.
  - Building 988 (Photo C-10) contains offices that have been badly damaged, reportedly from leaking pipes while the occupants were offpost. Paint was observed peeling from the walls, and cracked tiles were noted on the floor,
  - Building 998 (Photo C-11) contains offices
- Several rooms in each building could not be inspected because keys were not available.
- Minimal cleaning and paint supplies were observed in each building.
- Environmental concerns in each building include potential asbestos-containing material (ACM) consisting of ceiling tiles, 12 x 12 floor tiles, and possible Thermal System Insulation (TSI) and potential lead-based paint (LBP).

The following additional observations were also noted at Site C:

- Drainage canals were observed along the roadways surrounding the buildings.
- A solid-waste dumpster was observed to the west of Building 979.
- An approximately 10 foot by 10 foot concrete pad was observed between Buildings 979 and 999 (Photo C-12). The site escorts did not know the purpose of this pad. Reportedly, a picnic table is occasionally placed on this pad in the warm weather (Wilson, pers. comm.).
- Storage containers were observed west of building 999 in a corner of the parking lot (Photo C-13). These containers had markings indicating their use for videography.
- A pole-mounted transformer was observed in the northeastern portion of the site (Photo C-14). There was no apparent "non-PCB" sticker on the transformer.
- Fire hydrants were observed in the eastern portion of the site, where the barracks had been in the past (Photo C-15).
- Large pieces of solid waste were observed in the western portion of the site (Photo C-16).

4.4.3 Site L

Site L primarily consists of undeveloped grasslands with a few trees, small parking lots, and roadways (Photos L-1 and L-2). The following observations were made during the reconnaissance of Site L:

- A small wetlands area was observed on the northern portion of the site.
- An underground Comcast line runs north-south along the eastern edge of the site (Photo L-3) and an underground water line runs north-south through the center of the site.
- Storm and sewer manholes were observed throughout the site (Photo L-4).
- A concrete drainage culvert runs north-south along the eastern boundary of the site; an empty 55-gallon drum was observed within the canal in the south-central portion (Photo L-5).
- Three concrete pads were observed along the eastern edge of the site, most likely covering electrical boxes (20 volts was observed in writing on each pad): one pad was in the northeast corner (Photo L-6), one just north of 14th street (Photo L-7), and one in the north-central portion of the site (Photo L-8).
- Two concrete pads with plastic tubes emerging were observed on the site: one near the southern tip of the site (Photo L-9) and one in the east-central portion of the site (Photos L-10 and L-11). The tubes in these pads were most likely for electrical wires and the pads may be former transformer pads.
- The Freidhofer Cemetery is located in the west-central portion of the site and is an approximately 40 foot by 40 foot cemetery enclosed by a chain-link fence (Photo L-12).
- A large hill and circular roadway leading up to an asphalt-parking lot (Photo L-13) is located on the northwestern edge of the site. This hill is identified as Division Hill and according to the plaque at the base of the hill (Photo L-14), there used to be a command center with several buildings at the top of the hill during WWII.
- Pole-mounted transformers were observed on the property:
    - A pole-mounted transformer (Pole No. 28129 T19-21) is located in the north-central portion of the site, just south of the small parking lot (Photo L-15). A non-PCB label was not observed and no staining was observed.

- A pole-mounted transformer was observed on the hill on the northwestern portion of the property (Photo L-16) with Pole No. 28110 T18. A non-PCB label was observed on the transformer and no staining was observed on the transformer or pole.

4.4.4 Site S

Because of the size of Site S and the lack of roads and buildings by which to orient the reader, a grid has been placed over Site S to use as a referencing tool (Figure 4-10). Site S currently consists primarily of two landfill cells, several wetlands areas, and undeveloped woodland. Many other features are also present on Site S. The following observations were made during the site visits:

- Two medium-size ponds were observed on this site (Photo S-1): both in the Northwestern quadrant in grid cells F4, G4, and G5. No oily sheens were observed on either pond.
- Numerous methane vents were observed on both landfill cells (Photo S-2).
- A series of pipes (Photo S-3) was observed along the southeastern ½ and eastern borders of the site in grid cells E9, F9, G9, H9, I9, J9, K8, and L7. These are reportedly associated with the methane collection system (Marquardt, pers. comm.). These pipes collect the methane in an approximately 1500-gallon above-ground storage tank (AST) enclosed within a locked gate in grid cell L7 (Photo S-4). The AST is on a concrete pad and is a steel double-walled tank. The enclosed area also contains a flare and a shed (Photo S-5). The enclosure and the shed were locked and neither could be accessed.
- Monitoring wells are located throughout Site S (Photo S-6). These wells were installed to monitor groundwater quality around and beneath the landfill.
- A portion of land in the northwest of the site, in grid cells H2, H3, H4, and I3, was cleared and is used primarily as storage for old dumpsters (Photo S-7), trailers, and gravel (Photo S-8).
- Also in the north-central portion of the site, in grid cell I4, was storage of what appeared to be empty Investigation Derived Waste (IDW) drums that were apparently used in the installation and development of some of the monitoring wells on Site S (Photo 9).
- An archery range is located in the woods near the northern edge of the site in grid cell G-1 (Photos S-10 and S-11)
- The Defense Information School (DINFOS) Field Training Site and Training Course is located in the southwestern portion of the site in grid cells A7, B7, C7, A8, B8, and C8 (Photo S-12).
- Several locked Target Sheds (nos. 4 and 8) were observed along the southwestern edge of the site (Photo 13). The sheds were accessed and they appeared to be used for storage of shooting range equipment (Photos S-14 and S-15).
    - About 10 feet southeast of the southeast edge of Target Sheds 4 and 8, was a three-sided concrete bin that probably held coal (Photos S-16 and S-17). Coal was noticed on the ground around the bin at Target Shed 4 (Photo S-18). These Target Sheds are currently not heated but may have had a coal furnace that provided heat in the past.
- Near the vicinity of Target Shed 4 is a water supply well and well house (Photo S-19). This is reportedly one of the wells that supply water for FGGM (McMullen, pers. comm.).

- A trailer for Metro Transit Police is also located along the southwestern edge of the site (Photo S-20). This trailer is reportedly used for classroom instruction and offices (Photo S-21).
- Pole-mounted transformers were observed at two different locations on Site S:
    - Three pole-mounted transformers were observed near the northeast corner of the landfill, next to the methane collection tank in grid cell K8 (Photo S-22). Non-PCB labels were observed on these transformers and no staining was observed.
    - Three pole-mounted transformers were observed near the southwest portion of the site, next to Target Shed 8 (Photo S-23). Non-PCB labels were observed on these transformers and no staining was observed.
- A beaver dam is located in the northwestern portion of the site, in grid cell E2 (Photo S-24).
- The abandoned Baltimore and Ohio Railroad embankment runs through the northern part of the wooded area parallel to and south of Rock Avenue (Photo S-25). An old railroad loading dock was observed adjacent to the embankment (Photo S-26).
- Foundations and unidentified structures were observed in different portions of the site:
    - In the northwestern portion of Site S, in grid cell G2, are two old foundations (Photos S-27 and S-28); the northern foundation may actually have been for vehicle scales to determine the tonnage of waste to be placed in the landfill (Photo S-29).
    - A concrete trough with a slope on one end (Photo S-30) is located in the northern portion of the site, in grid cell L5.
    - An old foundation near Target Shed 8 (Photo S-31) is located in the southwest portion of the site in grid cell A8. Pipes run through the floor of the foundation (Photo S-32) and water and sanitary sewer lines are adjacent to the southeast corner of the foundation (Photo S-33).
- Household trash was observed throughout the following portions of the site:
    - An old washing machine in the southeastern portion of landfill (Photo S-34).
    - Litter on the ground in the southern portion of the site in grid cell B6 near Target Shed 4 and the Metro Transit Police trailer (Photo S-35).
    - An old automobile (Photo S-36), refrigerator (Photo S-37), and similar trash were observed along the northeastern portion of the site in grid cells L5 and M6 just south of the residential property north of Site S. It was noted that the fence did not extend into this area and access to FGGM was not limited.
- Staining was observed in puddles along the central part of the power line right-of-way (Photo S-38) in grid cell J4 near an area where the fence surrounding the landfill was knocked down (Photo S-39). This location is also downhill and near to the location where the IDW drums are stored.
- A small cemetery plot named for the Phelps family, early former landowners, is located just to the south of landfill Cell 1 (Photo S-40).
- Railroad tracks running northeast-southwest are immediately east of the eastern edge of the site and shooting ranges are immediately west of the site.
- Target Shed 49 is west of the western edge of the site (Photo S-41), west of grid cell E3, and just south of the beaver dam. The shed was accessed and appeared to be used for storage of excess shooting range equipment (i.e., cardboard backing for targets).

- A Fire Training Area was observed west of the western edge of the site (Photo S-42), west of grid cell E3 and south of the beaver dam and Target Shed 49. This Fire Training Area is reportedly used only rarely and when it is used, the Fire Department only tests equipment here; no fires are ignited or extinguished (McMullen, pers. comm.).
- A pole-mounted transformer is located near Target Shed 49 west of the southwestern edge of the site (Photo S-43). A non-PCB label was observed on the transformer and no staining was observed.

4.5 HISTORICAL TOPOGRAPHIC MAPS

This section discusses the historic topographic maps that were reviewed as part of this study. The maps indicate land use and natural resource changes that help characterize the environmental conditions at and around the sites. Maps from 1949, 1957, 1970, and 1979 were reviewed for each of the sites. Copies of the topographic maps depicting each site are included as Figures 4-11 through 4-14. Copies of the original topographic maps (without the site locations) are included in Appendix C.

4.5.1 Site A

Table 4-1: Summary of Historic Topographic Maps Depicting Changes at Site A

Date	Location	Observation
1949	Subject Property	Undeveloped land with a small structure on the eastern edge.
	Adjacent	North: Reece Road, followed by one medium-sized structure to the northeast, Franklin Branch and undeveloped land. East: A drive-in theater is located to the east of this site. A small cemetery (Friedhofer Cemetery) is also located to the east, just north of the drive-in theater. A command-center building that was reportedly constructed during World War II is shown to the east of the northeast quadrant of the subject property located on top of a hill. Small structures, most likely residences or offices, and associated roadways (Site L) followed by Annapolis Road – Maryland Route 175. South: A tributary of Franklin Branch, followed by mostly undeveloped, cleared land with one structure, followed by Mapes Road West: Undeveloped, wooded and cleared land and Franklin Branch. An airfield is west of Franklin Branch.

Date	Location	Observation
1957	Subject Property	Appears similar to the 1949 topographic map.
	Adjacent	North: No major changes since the 1949 topographic map, except that a couple of roads around the small structure to the northeast are portrayed. East: No major changes since the 1949 topographic map except that the drive-in theater along the eastern edge is no longer portrayed. There are minor roadway changes and more development east of Maryland Route 175. South: No major changes since the 1949 topographic map. West: No major changes since the 1949 topographic map.
1970	Subject Property	Appears similar to the 1957 topographic map except that three medium-sized structures are shown along the southern edge. An oval-shaped track is portrayed in the northwest quadrant of the site.
	Adjacent	North: No major changes since the 1957 topographic map except what appears to be a housing development to the northwest. East: No major changes since the 1957 topographic map except that a large structure is depicted along the eastern edge of the site, and roadways have been extended. South: No major changes since the 1957 topographic map except there are a few more structures south of Mapes Road. West: No major changes since the 1957 topographic map except the airfield to the west of Franklin Branch is no longer shown.
1979	Subject Property	No major changes since the 1970 topographic map.
	Adjacent	North: No major changes since the 1970 topographic map. East: Several of the small structures to the east have been cleared. South: No major changes since the 1970 topographic map. West: No major changes since the 1970 topographic map.

4.5.2 Site C

Table 4-2: Summary of Historic Topographic Maps Depicting Changes at Site C

Date	Location	Observation
1949	Subject Property	The site contains approximately 35 to 40 small structures and three small roadways.
	Adjacent	North: Primarily undeveloped woodlands with two small structures and Franklin Branch. East: Annapolis Road – Maryland Route 175 followed by woodlands with a few small structures. South: 18th Street, followed by numerous small structures and associated roadways, followed by Reece Road. West: Ernie Pyle Street, followed by two small structures, woodlands and Franklin Branch

Date	Location	Observation
1957	Subject Property	No major changes since the 1949 topographic map.
	Adjacent	North: No major changes since the 1949 topographic map. East: Numerous small to medium-sized structures were constructed east of Maryland Route 175. South: No major changes since the 1949 topographic map. West: No major changes since the 1949 topographic map.
1970	Subject Property	No major changes since the 1957 topographic map.
	Adjacent	North: No major changes since the 1957 topographic map. East: No major changes since the 1957 topographic map. South: No major changes since the 1957 topographic map. West: The two small structures were enlarged and reconfigured into one large structure.
1979	Subject Property	No major changes since the 1970 topographic map.
	Adjacent	North: No major changes since the 1970 topographic map. East: No major changes since the 1970 topographic map. South: No major changes since the 1970 topographic map. West: No major changes since the 1970 topographic map.

4.5.3 Site L

Table 4-3: Summary of Historic Topographic Maps Depicting Changes at Site L

Date	Location	Observation
1949	Subject Property	Site L primarily consists of small structures, most likely residences or offices, and associated roadways. Three medium-sized buildings are portrayed in the northwest quadrant of the site. A drive-in theater is located on the eastern edge of this site. A small cemetery (Friedhofer Cemetery) is also located on the eastern edge, just north of the drive-in theater. A building command center that was built during World War II is shown in the northeast quadrant of the subject property located on top of a hill.
	Adjacent	North: Reece Road and numerous small structures, most likely residences or offices, and their associated roadways. East: Chisholm Avenue and many small structures, most likely residences or offices, and their associated roadways, followed by Annapolis Road – Maryland Route 175. South: 13th Street, followed by several small structures, most likely residences or offices, and their associated roads. West: Mostly undeveloped and cleared land.

Date	Location	Observation
1957	Subject Property	No major changes since the 1949 topographic map.
	Adjacent	North: No major changes since the 1949 topographic map. East: No major changes since the 1949 topographic map except more development east of Maryland Route 175. South: No major changes since the 1949 topographic map. West: No major changes since the 1949 topographic map except that the baseball field immediately adjacent to the west of the site is no longer portrayed.
1970	Subject Property	No major changes since the 1957 topographic map except for a structure south of the cemetery.
	Adjacent	North: No major changes since the 1957 topographic map. East: No major changes since the 1957 topographic map. South: No major changes since the 1957 topographic map except for three structures to the southwest. West: No major changes since the 1957 topographic map except that the baseball field immediately adjacent to the west is no longer portrayed.
1979	Subject Property	No major changes since the 1949 topographic map.
	Adjacent	North: No major changes since the 1949 topographic map. East: Many of the small structures have been cleared. South: No major changes since the 1949 topographic map. West: No major changes since the 1949 topographic map.

4.5.4 Site S

Table 4-4: Summary of Historic Topographic Maps Depicting Changes at Site S

Date	Location	Observation
1949	Subject Property	Site S primarily consists of undeveloped woodlands. Two small tributaries run through the northern and central portions of the site. There is a small trail running north-south near the western border of the site. Near the center of the site, there are a few roads and approximately 12 small structures described as ammunition bunkers according to other historic documents. Two other small structures are located in the subject site; one is located in the northwest quadrant, and the other is located in the southwest quadrant along the edge of the site. The latter structure is most likely a Target Shed for the pistol and rifle ranges adjacent to the west.

Date	Location	Observation
	Adjacent	North: Railroad tracks of the Baltimore and Ohio railroad and several small structures, most likely residences, followed by Magazine Road, followed by several smaller roads and small structures (most likely residences or offices). Warehouses are located to the northwest. East: A roadway, followed by a small cemetery and undeveloped woodlands, followed by railroad tracks, then by undeveloped woodlands with a few small structures. South: Railroad tracks, followed by undeveloped woodlands with a couple of small trails. West: Pistol, machine gun, and rifle ranges with a few associated small structures, followed by undeveloped woodlands. Immediately adjacent to the northwest, the map shows a few small structures.
1957	Subject Property	More roadways were added to the bunker area in the central portion of the site. Two more small structures were added to the bunker area, and two small lakes are shown in the center of the formation. Another small structure is portrayed in the southwest corner of the site and a larger area is cleared of trees in this area.
	Adjacent	North: No major changes since the 1949 topographic map except a "tank" (probably a water tank) is depicted to the northwest, and more structures appear further to the northwest. East: No major changes since the 1949 topographic map. South: No major changes since the 1949 topographic map. West: No major changes since the 1949 topographic map except that several more structures and a water tank are shown immediately adjacent to the northwest.
1970	Subject Property	A large patch of land, most likely one of the two existing landfill cells, was cleared in the northeast quadrant of the site. A power line appears to run east-west through the northern portion of the site. Another roadway and small structure appears along the west, central edge of the site.
	Adjacent	North: No major changes since the 1957 topographic map. East: No major changes since the 1957 topographic map. South: No major changes since the 1957 topographic map. West: No major changes since the 1957 topographic map.
1979	Subject Property	A large patch of land, most likely the second of the two existing landfill cells, was cleared in the southeast quadrant of the site. A few small structures and a roadway appear in the eastern portion of the site, which are most likely associated with the landfill cells. Another structure just northwest of the bunkers was added.
	Adjacent	North: No major changes since the 1970 topographic map. East: No major changes since the 1970 topographic map except a trailer park is shown east of the railroad tracks. South: No major changes since the 1970 topographic map. West: No major changes since the 1970 topographic map except another small structure appears in the southwest quadrant.

4.6 HISTORICAL AERIAL PHOTOGRAPHS REVIEW

This section discusses the historic aerial photographs that were reviewed as part of this study. The aerial photographs indicate land use and natural resource changes that help characterize the environmental conditions at the sites. Aerial photographs from 1957, 1963, 1970, and 1980 were reviewed for each of the sites. Copies of these aerial photographs with site depictions are included as Figures 4-15 through 4-22. Copies of the original aerial photographs are included in Appendix D.

4.6.1 Site A

Table 4-5: Summary of Historic Aerial Photographs Depicting Changes at Site A

Date	Location	Observation
1957	Subject Property	Site A primarily consists of cleared land with a few wooded areas in the southwest quadrant. Several cleared roads or pathways are shown throughout the site. Several baseball fields are portrayed in the south-central portion.
	Adjacent	North: Reece Road, followed by undeveloped woodlands. One medium-size structure is located northeast of Site A. East: Small structures, most likely residences or offices, and their associated roadways (Site L) followed by Annapolis Road – Maryland Route 175. South: A tributary of Franklin Branch, followed by undeveloped, cleared land followed by Mapes Road. West: Undeveloped, wooded land and Franklin Branch.
1963	Subject Property	The site appears similar to 1957 aerial photograph. However, the 1963 aerial photograph shows an oval-shaped track in the northwest quadrant of the site and a building in the southeast corner of the site.
	Adjacent	North: No major changes since the 1957 aerial. East: No major changes since the 1957 aerial. South: No major changes since the 1957 aerial. West: No major changes since the 1957 aerial.
1970	Subject Property	Appears similar to the 1963 aerial photograph except that a few medium-size structures are shown along the southern edge, and an oval-shape track is shown on the northern portion of the site.
	Adjacent	North: Same as the 1963 aerial photograph. East: A large structure is depicted just east of the eastern edge of the site, south of center. South: No major changes since the 1963 aerial photograph. West: No major changes since the 1963 aerial photograph.
1980	Subject Property	The oval-shape track on the northern portion of the site is no longer portrayed, and a trailer park or recreational vehicle (RV) park is shown on the southern portion of the site.

Date	Location	Observation
	Adjacent	North: No major changes since the 1970 aerial photograph. East: The medium-size building along the eastern edge is no longer apparent and there are no structures between Chisholm and 175 north of 15th street. South: No major changes since the 1970 aerial photograph. West: No major changes since the 1970 aerial photograph.
1988	Subject Property	No major changes since the 1980 aerial photograph.
	Adjacent	North: Mostly the same as the 1980 photo. Two structures northeast of the site (across Reece Road) are portrayed. East: No structures appear between 14th and 15th streets east of Chisholm, west of 175. South: No major changes since the 1980 aerial photograph. West: No major changes since the 1980 aerial photograph.

4.6.2 Site C

Table 4-6: Summary of Historic Aerial Photographs Depicting Changes at Site C

Date	Location	Observation
1957	Subject Property	Site C primarily consists of small structures, most likely residences or offices, and associated roadways amid several small wooded areas.
	Adjacent	North: Primarily undeveloped woodlands with several small trails. A few small structures are shown just off the northeast corner of the subject site. East: Annapolis Road – Maryland Route 175 followed by numerous structures of varying sizes. South: 18th Street, followed by numerous small structures and associated roadways, followed by Reece Road. West: Ernie Pyle Street, followed by a large structure, followed by undeveloped, wooded land with several trails and Franklin Branch.
1970	Subject Property	No major changes since the 1957 aerial photograph.
	Adjacent	North: No major changes since the 1957 aerial photograph. East: No major changes since the 1957 aerial photograph. South: No major changes since the 1957 aerial photograph. West: No major changes since the 1957 aerial photograph.

Date	Location	Observation
1980	Subject Property	Many of the structures in the northeast quadrant of the site were cleared.
	Adjacent	North: Many of the structures just to the northeast appear to have been cleared. East: No major changes since the 1970 aerial photograph. South: No major changes since the 1970 aerial photograph. West: No major changes since the 1970 aerial photograph.
1988	Subject Property	All of the structures in the northeast quadrant of the site have been cleared. Structures remain only on the northwest quadrant.
	Adjacent	North: No major changes since the 1980 aerial photograph. East: No major changes since the 1980 aerial photograph. South: No major changes since the 1980 aerial photograph. West: No major changes since the 1980 aerial photograph.

4.6.3 Site L

Table 4-7: Summary of Historic Aerial Photographs Depicting Changes at Site L

Date	Location	Observation
1957	Subject Property	Site L primarily consists of small structures, most likely residences or offices, and their associated roadways. A medium-size building (the command center building) amid a large wooded area is shown in the northwest quadrant of the site.
	Adjacent	North: Reece Road, followed by numerous small structures, most likely residences or offices, and their associated roadways. East: Chisholm Avenue, followed by many small structures, most likely residences or offices, and associated roadways, followed by Annapolis Road – Maryland Route 175. South: 13th Street, followed by several small structures, most likely residences or offices and their associated roads. West: Undeveloped, cleared land (Site A).
1963	Subject Property	No major changes since the 1957 aerial photograph.
	Adjacent	North: No major changes since the 1957 aerial photograph. East: No major changes since the 1957 aerial photograph. South: No major changes since the 1957 aerial photograph. West: No major changes since the 1957 aerial photograph.
1970	Subject Property	A medium-sized building is depicted near the middle portion of the site.

Date	Location	Observation
	Adjacent	North: No major changes since the 1963 aerial photograph. East: No major changes since the 1963 aerial photograph. South: No major changes since the 1963 aerial photograph. West: No major changes since the 1963 aerial.
1980	Subject Property	The medium-sized building on Site A is no longer depicted.
	Adjacent	North: No major changes since the 1970 aerial photograph. East: Many of the structures to the east (north of 15th street, south of 17th street, east of Chisholm Avenue, west of Maryland Route 175) are no longer shown. South: No major changes since the 1970 aerial photograph. West: No major changes since the 1970 aerial photograph.
1988	Subject Property	No major changes since the 1980 aerial photograph.
	Adjacent	North: No major changes since the 1980 aerial photograph. East: Additional structures to the east (north of 14th street, south of 15th street, east of Chisholm Avenue, west of Maryland Route 175) are no longer shown. South: No major changes since the 1980 aerial photograph. West: No major changes since the 1980 aerial photograph.

4.6.4 Site S

Table 4-8: Summary of Historic Aerial Photographs Depicting Changes at Site S

Date	Location	Observation
1957	Subject Property	Site S primarily consists of undeveloped woodlands with a few cleared roadways. The central portion of the site contains a circular cleared area with a pond, a few wooded areas, and several roadways. (Based on several other historic documents, this circular area appears to have contained several ammunition bunkers). There are also several small patches of cleared land in the northeast corner of the site. Power lines trend east-west in the northern 1/3 of the site. There is a rectangular structure in the southwest edge of the site.
	Adjacent	North: Magazine Road, followed by several smaller roads and small structures (most likely residences or offices). East and southeast: Railroad tracks, followed by undeveloped woodlands with a few small structures. South: Railroad tracks, followed by undeveloped woodlands. West: Firing ranges.

Date	Location	Observation
1963	Subject Property	A patch of land was cleared in the northwest quadrant of the property. Two small structures are portrayed in the northwest quadrant. Two structures to the northwest adjacent to the road that leads to the ammunition bunkers. A square piece of land was cleared in the southern quadrant of the site. Some area was cleared around the Fire Training Area and the associated small structures. Another structure is visible on the southwest edge of the site; this structure may have been obscured by the legend in the 1957 aerial photograph.
	Adjacent	North: No major changes since the 1957 aerial photograph. East: No major changes since the 1957 aerial photograph. South: No major changes since the 1957 aerial photograph. West: A few small structures associated with the firing ranges were built.
1970	Subject Property	A large patch of land, most likely one of the two existing landfill cells, was cleared in the northeast quadrant of the site. Many trees were removed, possibly in preparation for the next landfill cell, east and southeast of the site.
	Adjacent	North: No major changes since the 1963 aerial photograph. East: No major changes since the 1963 aerial photograph. South: No major changes since the 1963 aerial photograph. West: No major changes since the 1963 aerial photograph.
1988	Subject Property	A large patch of land, most likely the second of the two existing landfill cells, was cleared in the southeast quadrant of the site. The training field is portrayed in the southwest corner of the site. The two structures that were once located in the northwest quadrant of the site are no longer shown.
	Adjacent	North: The land to the northwest was cleared most likely for the construction of Maryland Route 32. East: No major changes since the 1970 aerial photograph. To the southeast, the railroad yard is developing. South: More land to the south has been cleared, but remains undeveloped. West: No major changes since the 1970 aerial photograph.

4.7 DATABASE SEARCHES

URS reviewed information gathered from several environmental databases through EDR to evaluate whether activities on or near the subject properties have the potential to create a Recognized Environmental Condition (REC) on the subject properties. EDR reviews databases compiled by Federal, state, and local governmental agencies. The complete list of databases reviewed by EDR is provided in EDR's report, which is included in Appendix D. It should be noted that this information is reported as URS received it from EDR, which in turn reports information as it is provided in various government databases. It is not possible for either URS or EDR to verify the accuracy or completeness of information contained in these databases. However, the use of and reliance on this information is a generally accepted practice in the conduct of environmental due diligence. A description of the databases searched and the information obtained is summarized below:

4.7.1 Sites A and L

Sites A and L are reviewed together because the sites are adjacent to each other and one EDR report was generated for the two sites combined.

Subject Property: The subject properties were not listed in any of the regulatory databases, except for being listed as a DoD site.

Surrounding Properties: The EDR report identified the following five sites in the surrounding area in regulatory databases:

- 1942-94 Annapolis Road, ¼ - ½ mile north, identified as Firestone Store #0435: listed on the Historical leaking underground storage tank (LUST) database (tank has been removed)
- 1925 Reece Road, ¼ - ½ mile northeast, identified as Meade Heights Elementary: listed on the RCRA Small-Quantity Generator (SQG) database (no violations) and the UST database
- 2212 Chisholm Road, ¼ -½ mile north-northwest: listed on the UST database
- Maryland Route 175 and Mapes Road, ¼ -½ mile southeast, identified as EPA Environmental Science Center: listed on the RCRA SQG database (no violations)
- 1604 Annapolis Road, ½ -1 mile southeast, identified as Amoco Paceway: listed on the Historical LUST database (case is still open, but the site is reportedly downgradient from the subject properties)

None of the above sites is expected to create a REC on the subject property because no violations or past activities that may indicate a potential risk have occurred. Further, the potential LUST site on Annapolis Road is located downgradient of Sites A and L; a downgradient location reduces the probability that contaminants could migrate via water or soil to Sites A or L.

Orphan Sites: URS reviewed the Orphan List Sites, which are sites that have not been geocoded based on lack of sufficient data regarding their exact location within the general area. The review of the Orphan List Sites did not identify properties that are likely to create a REC on the subject properties.

4.7.2 Site C

Subject Property: One site within the target property area, 2212 Chisholm Avenue, was listed in the UST database. However, because the subject property site does not appear on the LUST database, it is unlikely to create a REC on the subject property.

Surrounding Properties: The EDR report identified the following three sites in the surrounding area in regulatory databases:

- 1942-94 Annapolis Road, < ⅛ mile east-northeast, identified as Firestone Store #0435: listed on the Historical LUST database (tank has been removed, case is closed)

- 1925 Reece Road, ¼ - ½ mile east, identified as Meade Heights Elementary: listed on the RCRA SQG database (no violations) and the UST database
- 2900 MacArthur Road, ¼ - ½ mile west, identified as Manor View Elementary: listed on the RCRA SQG database (no violations)

None of the above sites is expected to create a REC on the subject property because of the absence of RCRA violations, past tank removals, or LUSTs.

Orphan Sites: The review of the Orphan List Sites did not identify properties that are likely to create a REC on the subject properties.

4.7.3 Site S

Subject Property: One site within the target property area was listed in the NPL, CERCLIS, RCRA TSD, RCRA LQG, and ROD databases (most likely due to the landfill):

- Maryland Route 175, ⅛ – ¼ mile east: several past RCRA violations.

Surrounding Properties: Three sites within ¾ miles of the subject property were listed on the Historical LUST database. However, since all three cases have a closed status, they are unlikely to create a REC on the subject property. Seven sites within ¾ miles of the subject property were listed on the LUST database. Five of the sites have a closed status and therefore are not expected to create a REC on the subject property. The following two site cases remain open in the LUST database:

- 1433 Annapolis Road, ½ - 1 mile northeast, identified as a Mobil
- 1433 Annapolis Road, ½ - 1 mile northeast, identified as Mobil Oil Corp SS# Chg.

These two open cases appear to be the same site but two different cases. However, since the site is located down/side gradient from the subject property, it is unlikely to create a REC on the subject property.

Orphan Sites: The review of the Orphan List Sites did not identify properties that are likely to create a REC on the subject property.

4.8 POTENTIAL FUTURE SITE USES

Potential future site uses include development with buildings and infrastructure. A new 36-hole golf course is proposed for Site S, which may include a new clubhouse, asphalt cart path, practice putting green, and a driving range.

4.9 SITE UTILITIES AND TRANSPORTATION

4.9.1 Water Systems

FGGM operates a water treatment plant. It receives water from six groundwater wells and the Little Patuxent River. The river water intake and low lift pumping station extract about 7 million gallons per day (mgd). The wells vary in depth from 70 to 800 feet.

4.9.2 Sanitary Systems

An extensive sanitary system serves FGGM. With both gravity and force mains, service connection sewers, a major pumping station, and many small pumping stations, FGGM's sewage treatment plant has the a capacity to treat 4.5 mgd and a peak capacity of 12.3 mgd.

4.9.3 Electrical Systems

Power is supplied to FGGM by the Baltimore Gas and Electric Company. No electrical power is generated on site, although the base does have many emergency, stand-by generators.

4.9.4 Transportation

Several roadways allow direct access to FGGM from Maryland Route 32, Maryland Route 175, and Maryland Route 275. From the west, there is direct access from Maryland Route 295. From the east, FGGM can be accessed from Maryland Route 175 at Rockenback Road, Reese Road, Mapes Road, and Llewellyn Avenue. From the south, Mapes road off Maryland Route 32 and Pepper Road access the base. The NSA maintains exclusive use of FGGM's western boundary and maintains several gates. Site S is accessed by Pepper Road. Main thoroughfares through the base consist of Rock Avenue, Llewellyn Avenue, Mapes Road, Reece Road, and Rockenbach Road going east-west, and Ernie Pyle Street, MacArthur Road, Cooper Avenue, O'Brien Road, and Canine Road running north-south.

Two commuter railroad lines service FGGM. The closest station for the western line is located in Jessup, approximately 1.5 miles to the west. The closest for the eastern line is at Odenton, 1.5 miles to the east.

Maryland Mass Transit Administration does not offer bus service to FGGM.

4.9.5 Asbestos

4.9.5.1 Site A

Site L contains one structure along the southern edge, *Building 2724*, which is the trailer park shop. An Asbestos Survey and Management Plan was completed for the building In July 1997 (BCM, 1997). Twelve samples throughout the one-story building were collected and none were determined to contain ACMs.

4.9.5.2 Site C

In March and September of 1996, Asbestos Surveys and Management Plans were completed for each of the six buildings located on Site C (BCM, 1996a through h). In general, the suspect materials that were sampled in each building included, but were not limited to, floor tiles, floor tile mastic, carpet mastic, baseboard mastic, drywall system, ceiling tiles, and thermal pipe insulation. The following is a brief description of the ACMs that were identified in each of the six buildings:

Building 948: Of the 25 samples collected, none were found to contain asbestos.

Building 949: BCM collected 22 samples from the building. Only one sample, a roof shingle from the roof, detected a trace of chyrsotile asbestos (<1%). Because the amount of asbestos was <1%, this material is not considered to be asbestos-containing. No asbestos was detected in the remaining 21 samples.

Building 968: Seventy-five samples were collected from the building. Thirteen of the samples were determined to be asbestos-containing:

- 1st Floor:
  - *12 X 12 Brown streak floor tile & mastic* - 2% chrysotile
  - *Baseboard mastic* - 2% chrysotile
- Restrooms (1st Floor)
  - *Plaster ceiling* - 2% chrysotile
  - *Pipe fitting insulation on aircell line* - 75% chrysotile and 5% amosite
  - *Pipe insulation (aircell)* - 7% chrysotile
  - *Pipe insulation (mag)* - 5% chrysotile and 30% amosite
- Restrooms (2nd Floor)
  - *Pipe fitting insulation* - 30% chrysotile
  - *Pipe insulation (mag)* - 5% chrysotile and 25% amosite
  - *Pipe insulation (paper)* - 25% chrysotile.
- 2nd Floor:
  - *12 x 12 brown floor tile* - 2% chrysotile
  - *Floor tile mastic* - 2% chrysotile
- Top of stairs:
  - *Floor tile mastic* - 2% chrysotile
  - *Baseboard mastic* - 2% chrysotile

Building 978: Seventy-six samples were collected. Twelve samples were identified as asbestos-containing:

- 1st Floor:
  - *Furnace gasket* – 40% chrysotile
  - *9x9 red-brown w/ white streak floor tile* – 5% chrysotile
  - *Drywall system* – 2% chrysotile
- 1st Floor Restroom:
  - *4-inch pipe insulation (mag)* – 30% chrysotile and 10% amosite
  - *4-inch pipe insulation (aircell)* – 20% chrysotile
  - *4-inch pipe fitting insulation* – 30% chrysotile

- 2nd Floor:
  - *9x9 Red-brown w/white streak floor tile* – 2% chrysotile
  - *Floor tile mastic* – 2% chrysotile
  - *9x9 Dark brown w/ white streak floor* tile – 10% chrysotile
- 2nd Floor Restroom:
  - *4-inch pipe insulation (mag)* - 30% chrysotile and 5% amosite
  - *4-inch pipe insulation (aircell)* – 20% chrysotile
  - *4-inch pipe fitting insulation* – 30% chrysotile

Building 979: Of 28 samples collected, only 1 contained asbestos:

- Furnace Room:
  - *Furnace insulation* – 50% chrysotile

Building 988: Seventy-six samples were collected throughout the building. Fourteen of the samples were asbestos-containing:

- 1st Floor:
  - *12x12 Beige w/ gray streak floor tile* – 2% chrysotile
  - *12x12 Brown w/ brown streak floor tile* – 10% chrysotile
  - *Floor tile mastic* – 2% chrysotile
- 1st Floor Restroom:
  - *4-inch pipe fitting insulation (mag lines)* – 30% chrysotile
  - *4–inch pipe insulation (mag)* – 20% chrysotile and 20 % amosite
  - *4-inch pipe insulation (aircell)* – 30% chrysotile
- 1st Floor Boiler Room:
  - *Furnace gasket* – 60% chrysotile
- 2nd Floor:
  - *12x12 Beige w/gray streak floor tile* – 2% chrysotile
  - *Floor tile mastic* – 2% chrysotile
  - *12x12 brown floor tile* – 5% chrysotile
- 2nd Floor Restroom:
  - *Plaster ceiling* – 5% tremolite/actinolite
  - *4-inch pipe fitting insulation (aircell lines)* – 30% chrysotile
  - *4-inch pipe insulation (aircell)* – 30% chrysotile
  - *4-inch pipe insulation (mag)* – 30% chrysotile and 10% amosite

Building 998: Of 34 samples collected, none were determined to be asbestos-containing. On the second floor, the drywall system in a couple rooms and the plaster ceiling in the restroom had trace amounts of tremolite/actinolite. However, the amounts were <1% and are not considered to be ACMs.

Building 999: Of the 29 samples taken, none were identified as asbestos-containing.

NOTE: Many of the samples in each building that had ACMs were not analyzed because a previous homogenous area within the building had already tested positive.

4.9.5.3 Site L

At the time of the site visit, there were no structures on Site L. Therefore, ACMs are unlikely to be present on the site.

4.9.5.4 Site S

There are no asbestos survey reports available for the structures on Site S.

4.9.6 Lead

4.9.6.1 Site A

In 2001, direct-push soil and groundwater samples were collected in the vicinity of Building 2724 (currently the Youth Services Building) which is located on the southeast corner of the site. Both the soil and groundwater were determined to contain lead. The lead in the soil was below residential and industrial standards. However, the levels of lead in the groundwater were above MDE cleanup standards (Versar, 2001a). Later in 2001, direct-push soil and groundwater samples were also collected in the vicinity of Building 2728 (no longer on the site) which was located in the southwest portion of the site. Lead was detected in both the soil and groundwater samples, but at levels below the standards (Versar, 2001b).

Since the building have been on the site since at least 1963, there is a possibility that LBP was used on the building and lead may be present in the soils around the buildings. However, there have been no studies conducted to confirm this.

4.9.6.2 Site C

Lead was not detected in soil nor groundwater samples that were collected in the vicinity of Building 1007, which is located just off the northeast corner of the site (Versar, 2000b). There have been no LBP studies. However, because the eight buildings have been onsite since at least 1957, there is a possibility that LBP is present on the buildings and lead may be present in the soil throughout the site.

4.9.6.3 Site L

Soil samples that were collected in 2001 in the south-central portion of the site (where Building 2831 used to be located) did not contain lead (Versar, 2000a). Because there were structures on this site in the past, potential lead residue in soil due to LBP may be present. There have not been any groundwater investigations on this site.

4.9.6.4 Site S

Since as early as 1994, numerous groundwater, surface water, sediment, and soil investigations have been conducted throughout the site. Lead has been detected in all four media several times. A more detailed summary is provided in Section 4.2.4. Also, there is a likelihood that LBP is present on the target sheds located along the southwestern edge of the site.

4.9.7 Pesticides and Herbicides

Pesticides and herbicides were not observed on the sites during the reconnaissance. However, according to prior reports, groundwater samples collected in the past on Sites A and S have been analyzed for pesticides and herbicides.

4.9.7.1 Site A

In 2001, direct-push soil and groundwater samples were collected in the vicinity of Building 2724 (currently the Youth Services Building) which is located on the southeast corner of the site. Pesticides and herbicides were not found in any of the soil or groundwater samples. However, one herbicide, MCPA, was detected in the samples at levels exceeding tap water standards (Versar, 2001a).

Later in 2001, direct-push soil and groundwater samples were also collected in the vicinity of Building 2728 (no longer on the site) which was located in the southwest portion of the site. Three pesticides and three herbicides were detected in the soil samples. However, none were found to be above residential or industrial standards. Neither pesticides nor herbicides were detected in the groundwater samples (Versar, 2001b).

4.9.7.2 Site S

In 1994, the herbicide atrazine was detected in one of the wells near the sanitary landfill (which was still active at that time) above its MCL. Later, in 1995, groundwater, surface water, sediment and soil samples were collected to determine if the landfill was the source of the atrazine. However, atrazine was not detected in any of the samples implying that the landfill was not the source (Little, 1999).

Surface water, soil, and groundwater samples were also collected at a few off-post locations that are down-gradient from the landfill. Atrazine was not detected in the surface water and soil samples. It was detected in a groundwater sample at one of the monitoring wells at a level below the MCL but above the tap water standards (Arthur D. Little, 1999).

In 2001, groundwater samples were collected from monitoring well MW-4DR which is located north of landfill cell 2. Neither pesticides nor herbicides were detected in the samples (IT Corporation, 2001). In 2003, a groundwater investigation was conducted at the landfill. Groundwater samples from the Upper Patapsco Aquifer did not reveal the presence of pesticides or herbicides (EM Federal Corporataion, 2003).

4.9.8 Radon

Radon is a naturally occurring radioactive gas that is found in soil and rocks. Radon flows through the voids in rocks and soils to the surface. Radon is of some concern when it collects in low-lying enclosed spaces, such as an occupied basement. Since none of the buildings on the four sites have sub-grade levels, radon is unlikely to be a factor.

An EPA survey by zip code of indoor radon concentrations indicated that none of the 10 zip code locations tested for FGGM were greater than 4.0 picoCuries per Liter (pCi/L). The EPA action level for radon is 4.0 pCi/L. The Federal EPA Radon Zone for Anne Arundel County is 2, which

is a moderate level.

4.9.9 Hazardous Materials

Hazardous materials were not observed on any of the four sites. Cleaning supplies, as well as a few 5-gallon paint cans were observed in the eight buildings located on Site C. However, these supplies were considered to be *de minimis* quantities and are not likely to create a REC.

4.9.10 Radioactive Materials

Radioactive materials were not observed on any of the sites during the reconnaissance. There have not been any studies conducted to determine the presence of radioactive materials. However, according to a prior report, a building that was located in the south-central portion of Site L (Building 2831) used to contain x-ray processing units (Versar, 2000a).

5.1 SITE A

Site A is classified in the Administrative Zone. Over the years, Site A has seen little development and has been used mostly for ball fields. Currently, ball fields, bleachers and lighting cover most of the site. The only improvements are Building 2724 and a recreational vehicle storage yard (RV park), which occupy the southern end of Site A. In the past, another building (2728) was located in the southwestern portion of this site. Environmental investigations had been conducted at Building 2724, the wash racks and oil/water separators located west of Building 2724, and the wash racks at Building 2728. Soil and groundwater samples were collected for chemical analysis and some compounds were detected above certain EPA Region III Risk-Based Concentrations (RBCs) and Maryland Department of the Environment (MDE) cleanup standards. Arsenic was one of the compounds detected in soil. It was detected at concentrations of 2 mg/kg or greater in eight of the samples collected, including surface and subsurface samples; the highest concentration was 2.7 mg/kg. The EPA residential value is 0.43 mg/kg, industrial value is 1.9 mg/kg. The MDE residential value is 2.0 and the nonresidential value is 3.8 mg/kg. The herbicide MCPA and Total Petroleum Hydrocarbons (TPH)-Diesel Range Organics (DRO) recorded the greatest exceedances in groundwater. Several metals and VOCs (including carbon tetrachloride) also exceeded action levels. The greatest concentration of MCPA was 1,400 µg/l, compared to an RBC for tap water of 18 µg/l. The greatest concentration of TPH-DRO was 620 µg/l, compared to an MDE Groundwater Standard of 47 µg/l.

Due to the age of the buildings, lead from lead-based paint (LBP) may also be present on the existing building and in the soil around the existing building and in the soil around the former building location.

Site A contains designated Forest Conservation Act (FCA) areas. Development at this site would need to comply with Maryland FCA requirements. FGGM voluntarily supports the Maryland FCA and complies with the Act on a case-by-case basis. The FCA applies to all activities requiring a permit for subdivision, grading, or sediment control and that involve more than 40,000 square feet, or slightly less than 1 acre. The FCA provides guidelines for the amount of forest land to be retained or planted after the completion of development projects. These guidelines vary for each development site and are based on land-use categories. Site A contains a portion of a stream channel in the northwest corner of the site that is subject to a 25-meter buffer requirement.

The majority of Site A is suitable for transfer; Environmental Conditions of Property Classification (ECOP) category for the majority of the site is 1. The southernmost portion of Site A, around the current and former building locations would score a 6/7. It would score a 6 because chemical compounds detected in soil and groundwater were above action levels. It also scores a 7 because there is the potential for lead to be present in soil above action levels. Site soils in the vicinity of the current and former buildings have not been sampled for lead.

5.2 SITE C

Over the years, Site C had numerous barracks constructed in support of War efforts; most of those barracks have been torn down. Currently, the west-central quadrant of Site C contains wood-framed structures that are used for offices, meeting rooms, and storage. The east-central

quadrant is currently an open field with remnant asphalt surfaces. The northern and southern boundaries of the site have remained woodland over the years. The only environmental studies at Site C have been of potential asbestos-containing materials (ACM). Some materials in some of the buildings currently on-site were determined to contain asbestos. One other environmental study had been conducted in the area; a study of the Equipment/Vehicle Storage Yard Wash Rack System (Building 1007) located northeast of the northeast corner of Site C. Soil and groundwater samples were collected for chemical analysis and some compounds were detected above certain RBC and MDE cleanup standards. Arsenic was detected in soil at levels up to 17.8 mg/kg. TPH-Gasoline range Organics (GRO) was detected in groundwater at concentrations up to 6,910 µg/l. Benzene was detected in groundwater at concentrations up to 9.1 µg/l; the MDE Groundwater Standard is 5 µg/l and the RBC for tap water is 0.34 µg/l.

Additionally, Motor Pools may have been present southeast and northeast of Site C in the past. Since Site C is on a topographic high point, both of these Motor Pools would have been located downgradient of the site.

Due to the age of the current and former buildings on Site C, lead from paint may be present on the existing buildings and in site soil.

Natural resources constraints at Site C are limited to the designated FCA areas that are present along the eastern border of the site. Development at this site would need to comply with Maryland FCA requirements.

Due to the age of the current and former buildings on site and the potential for lead to be present in soil above action levels, the majority of Site C requires further study, placing it in ECOP category 7. Site soils in the vicinity of the current and former buildings have not been sampled for lead. The northwestern and southern portions of Site C would be classified in category 1, making it suitable for transfer. The northeastern of Site C, near where the old Motor Pool and current Equipment/Vehicle Storage Yard is located would score a 6 because chemical compounds were detected in soil and groundwater above action levels.

Although an old Motor Pool was located southeast of the southeastern portion of Site C, it was probably downgradient of Site C and therefore, probably would not have affected groundwater beneath Site C and would score a category 1.

5.3 SITE L

Over the years, numerous barracks and a command center were constructed at Site L in support of World War II. Those barracks and the command center have been torn down. Currently, Site L is mostly open fields with a few scattered clumps of trees. In the past, Pistol Range A occupied a 4-acre parcel that extended into the northeastern corner of Site L. Pistol Range A had been given a relative explosives safety risk of 5, corresponding to a negligible explosives safety risk. An environmental study had been conducted of Building 2831, a former building on Site L. Building 2831 held x-ray processing units and a laboratory where chemicals were used and stored. Soil samples were collected for chemical analysis and arsenic was detected in soil above the residential and industrial RBCs. Arsenic was also detected above its expected regional background level.

Additionally, a motor pool may have been present east of the northeast corner of the site in the past. Because of the buildings located on this site in the past, lead may also be present in the soil as a result of LBP being used on the buildings.

Site L contains natural and cultural resources constraints. Two small FCA areas, one at the north end and one along the west-central border, would require compliance with Maryland FCA requirements. A historic cemetery, the Friedhofer & Gary Cemetery, occupies an approximately 40-foot by 40-foot area along the western border of Site L.

Due to the age of the former buildings on site and the potential for lead to be present in soil above action levels, the majority of Site L requires further study, placing it in ECOP category 7. Site soils in the vicinity of the former buildings have not been sampled for lead. The old Motor Pool located northeast of the site would contribute to the category 7 score in this part of the site. The area around former building 2831 would score a 6 because chemical compounds were detected in soil above action levels. The western portion of Site L would be classified in category 1, making it suitable for transfer.

5.4 SITE S

Currently, the northern portion of Site S is a closed sanitary landfill and the southern portion is wooded. Firing ranges border the western and southwestern border of the site. Buildings that currently support range activities are located along the southwestern portion of this site. Over the years, Site S had been used as a training ground for cavalry and troops. Munitions reportedly had not been used in Training Area B, which is located in the northwest portion of Site S. However, around 1922 a machine gun range was noted in the southwest portion of the site. Ammunition Supply Points had been constructed in the central portion of the site but are no longer present.

The embankment for the abandoned Baltimore and Ohio Railroad runs through the northern part of the site and has the potential for contamination by Polynuclear Aromatic Hydrocarbons (PAHs) and other petroleum hydrocarbons, plus any spills that may have occurred.

Because of the age of the buildings formerly and/or currently on each of the sites, there is a possibility that LBP was used and may be present in the buildings or soil surrounding the buildings.

The landfill was constructed as an unlined facility and was managed as two cells. Numerous environmental studies had been conducted at Site S and the surrounding vicinity over the years. Soil, groundwater, and surface water samples had been collected for chemical analysis and some compounds were detected above certain RBC and MDE cleanup standards. Most studies indicate that separate contaminants affect the upper and lower aquifers underneath Site S, and that the lower aquifer contaminants (including carbon tetrachloride) probably originate from other sources north and/or west of Site S. As part of the landfill closure requirements, periodic monitoring of groundwater quality currently is being conducted at Site S. The landfill is listed in the National Priorities List (NPL), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), Resource Conservation and Recovery Act (RCRA) Treatment, Storage, Disposal (RCRA TSD), RCRA Large Quantity Generators (LQG), and Records of Decision (ROD) databases.

A majority of Site S is designated as FCA and is subject to Maryland FCA development requirements. Designated FCA areas are present along the northern, southern and western

boundaries of the site. Site S also contains three areas designated as critical habitat protection areas by the Department of the Army due to the presence of state rare and listed species: Rock Avenue Shrub Swamp, Range Road Obstacle Course, and Range Road Corridor. These designations were applied based on the current state and Federal rare, threatened, and endangered species lists at the time of designation. According to the 2003 list of Maryland rare, threatened and endangered species, the classifications have changed for several of the species of concern in the designated habitat protection areas. None of the previously identified species in these areas is legally protected with the state or Federal designation of threatened or endangered. The sites do contain plants included on the 2003 Maryland list as Watch List or Uncertain, which are designations that do not carry legal protection.

The Rock Avenue Shrub Swamp is the only true seasonally saturated/semi-permanent swamp present on FGGM and according to a 2001 Eco-Science report obtaining a permit for disturbance would be difficult (Eco-Science, 2001). Site S also contains numerous wetlands and open-water bodies. Disturbance of these areas would require permitting with Federal and state agencies and permit conditions would require avoidance, minimization, or mitigation of impacts.

Physical conditions that pose potential constraints on Site S include:

- The Phelps cemetery, containing five headstones, located in the southeastern portion of Site S.
- The methane-collection/venting system and methane vents installed within the landfill areas of Site S
- The presence of noise sources, which include the railroad, the adjacent railroad yard, and adjacent firing range.

Due to the age of the current and former buildings on site and the potential for lead to be present in soil above action levels, portions of Site S around these buildings requires further study, placing it in ECOP category 7 (these sites are not listed on the map). Site soils in the vicinity of the former buildings have not been sampled for lead.

Because studies have indicated the landfill may be affecting the shallow groundwater and surface water, the landfill would be placed it in ECOP category 6. Because studies indicate the deeper aquifer beneath Site S is affected by upgradient sources, the remainder of the site would be placed in category 6 also. The railroad grade in the northern portion of the site may require further study, placing it in category 7.

The following URS personnel contributed to this report:

Table 6-1: List of URS Personnel Contributing to the EBS Report

Name	Title	Years of Experience	Sections of Report Contributed to
Jerry Kashatus, PG	Principal Geologist	22	1, 2, 3.2 to 3.5, 4.1 to 4.8, 4.9.5 to 4.9.10, 5
Janet Frey, PG	Principal Scientist	18	3, 4.9,1 to 4.9.4, 5
Lynne McMullen	Environmental Scientist	3	2, 4.3 to 4.7, 4.9.5 to 4.9.10, 5
Fred Moose, PG	Project Geologist	38	2, 3.2 to 3.5, 4.1 to 4.8, 5
Laurie Lemieux	Environmental Scientist	2	1, 2, 3, 4.1
Kim Collini	Environmental Planner	4	3, 5
Molly Notestine	Ecologist	3	3

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